Technical Guidance for Health Impact Assessment In Alaska

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Department of Health and Social Services

Contents

Acronyms

ADHSS	Alaska Department of Health and Social Services
ADNR	Alaska Department of Natural Resources
ANTHC	Alaska Native Tribal Health Consortium
ATSDR	Agency for Toxic Substances and Disease Registry
BRFSS	Behavioral Risk Factor Surveillance System
CDC	U.S. Centers for Disease Control and Prevention
CE	Categorical Exclusions
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CSM	Conceptual Site Model
DSS	Demographic Surveillance Systems
DHHS	Department of Health and Human Services
EA	Environmental Assessment
EHA	Environmental Health Area
EIS	Environmental Impact Statement
EJ	Environmental Justice
EPA	Environmental Protection Agency
HAP	Health Action Plan
HEC	Health Effects Categories
HIA	Health Impact Assessment
HIPAA	Health Insurance Portability and Accountability Act
ICMM	International Council on Mining and Metals
IPIECA	International Petroleum Industry Environmental and Conservation Association
IFC	International Finance Corporation
IRB	Institutional Review Board
KPI	Key Performance Indicator
LMPT	Large Mine Permitting Team
M&E	Monitoring and Evaluation
NEPA	National Environmental Policy Act of 1969, as Amended
NPR-A	National Petroleum Reserve Alaska
NRC	National Research Council
OPMP	Office of Project Management and Permitting
PAC	Potentially Affected Communities
SDH	Social Determinants of Health
STI	Sexually Transmitted Infection
WHO	World Health Organization

Introduction

What is Health Impact Assessment?

A health impact assessment (HIA) is a structured planning and decision-making process that analyzes the potential positive and negative impacts of programs, projects, and policies on the public's health. Health impact assessments are performed *prior* to program, project, or policy implementation.

The HIA process has several key characteristics:

- Focused: evaluates a specific policy, program, or project proposal
- Balanced: considers potential positive and negative health impacts
- Multi-dimensional: considers many dimensions of population health, including both outcomes and determinants
- Multidisciplinary: incorporates information from many disciplines that influence health
- Flexible: evaluates actions of varying size and complexity, in a variety of settings
- Adaptable: the scope can be wide ranging or focused on a limited set of issues of particular concern; similarly, some aspects of a project may require in-depth evaluation and field studies, while others may only require a desktop analysis
- Transparent: the process is open and transparent to the public

In Alaska, funding and completion of an HIA is strictly voluntary. Neither Alaska law nor federal law mandates the completion of an HIA for any purpose, including for major resource development projects, new programs, or policies.

The goal of this toolkit is to help HIA practitioners prepare high-quality documents that inform decision makers about potential impacts to human health**.** The toolkit also helps help state and federal agency policy-makers and project applicants understand when an HIA may be helpful and how to integrate an HIA with the regulatory process and with the decision-making process. Because HIAs are voluntary, anyone can propose or perform one in Alaska. However, this document is intended to be a technical resource for HIA practitioners and provide details regarding the general HIA process in the Alaskan context.

Why perform HIAs in Alaska?

Alaska has a rich and widespread distribution of natural resources throughout the state. Alaska also has many communities located in rural areas throughout the state that are highly dependent on subsistence hunting and gathering. Resource development has the potential to bring substantive changes to rural and indigenous communities that are located in close proximity to the project. These changes can include revitalization of communities through economic growth and community projects, and/or they can include environmental exposure to toxins, interference with subsistence activities, and disruption to communities. Because the interaction between natural resource development and human health is dynamic and complex, HIAs provide an opportunity to identify both the health benefits and the potential health risks in any proposed resource development project, public policy, or new public program. When project applicants and policy makers invest time and resources to understand health impacts in advance, they enable opportunities to contribute to improving health status in communities,

reducing future health care costs, and lowering potential mitigation costs. They can also provide some assurance that human health has been carefully considered in decisions that affect the public.

HIA is an important tool that can help developers and policy-makers understand both negative and positive health effects of a proposed project. It can help developers create plans to enhance positive effects and reduce negative effects in a manner that fits Alaska's unique environmental, cultural, social, and public health context. Resource development is not the only area in which HIA is applicable. Other areas where HIA may be useful in Alaska include food policy, development of transportation infrastructure, emergency preparedness planning, and climate change response planning.

Here are some key aspects of HIA in Alaska:

- HIAs for resource development in Alaska are typically done as part of the National Environmental Policy Act (NEPA) process, when a lead federal agency determines that the impacts to human health should be evaluated as part of an Environmental Impact Statement (EIS) process.The primary goal of the HIA process is to address human health as part of resource development projects in Alaska. Generally, laws, regulations, and environmental standards are already in place for permits that are intended to protect human health. It is not the intent of the HIA to duplicate or undermine these.
- HIA is collaborative and is always done in close cooperation with all of the stakeholders and permitting agencies that are involved in a particular project, to help ensure that all permits are consistent and not conflicting with each other.

Alaska depends heavily on its natural resources for its economy, and therefore the health and economic well-being of its people. This HIA toolkit is a resource that will assist HIA practitioners in preparing high-quality, focused HIAs that inform stakeholders in detail regarding human health impacts, both positive and negative.

What is the history of HIA in Alaska?

The earliest HIAs in Alaska were written for an extension of the Red Dog Mine and a federal lease sale permit for the National Petroleum Reserve Alaska (NPR-A). These HIAs addressed key health considerations that the public raised during scoping for EISs during the NEPA and permitting processes. These early efforts, however, were lengthy, complex processes that revealed the need for technical guidance to support future HIAs in the state.

During September 8–10, 2008, the Alaska Native Tribal Health Consortium (ANTHC), the Alaska Department of Health and Social Services (ADHSS), and the U.S. Centers for Disease Control and Prevention (CDC) jointly hosted a workshop on HIA in Anchorage, Alaska. At the conclusion of this workshop, attendees were invited to participate in a working group, which convened regularly to guide the development of this HIA guidance document (also known as the "Alaska HIA Toolkit"). The working group reviewed a wide variety of scientific literature and HIA guidance documents, including the International Finance Corporation (IFC) "HIA Toolkit", which informs several sections of this guidance document.

The working group inserted Alaska-specific concerns where needed, such as subsistence nutrition and stakeholder engagement. To meet an operational need to maintain and update the HIA toolkit and coordinate the working group, ADHSS and the Alaska Department of

Natural Resources (ADNR) volunteered to accept a co-leadership role by jointly funding an HIA program. ADNR and ADHSS also serve a role in initiating and facilitating HIAs in parallel with the regulatory process for natural resource development projects.

The ADHSS HIA program is not a regulatory entity, but rather exists as a state resource to guide the development of HIA activities in Alaska. ADHSS maintains the Alaska HIA Toolkit and provides the most current version on the HIA Program website. ADHSS, including through the use of third party consultants, can also play the role of lead HIA practitioner for a project. Alternately, to provide flexibility for applicants or other agencies to lead the development of HIAs, ADHSS's role may be to review HIAs developed by other parties.

While ADHSS serves in this organizational leadership role, the HIA Program relies on robust participation from all partners affected by HIA-related projects. The Office of Project Management and Permitting (OPMP) at ADNR, which coordinates the review of larger scale projects in the State, facilitates multi-agency involvement in the scoping process and in the review of any HIA draft documents that may be being prepared. Involvement of these agencies brings in specific environmental and health expertise and ensures that the HIA is fully informed of all regulations, policies, and programs already in place to protect human health.

How can HIAs be developed simultaneously with the NEPA process?

The National Environmental Policy Act (NEPA) process requires a federal agency to evaluate the relevant environmental effects from actions that fall within its jurisdiction, such as issuing regulations, issuing permits, and making land management decisions. Agencies comply with NEPA via three different pathways. Categorical Exclusions (CEs) apply to categories of actions that the agency has decided do not individually or cumulatively have a significant effect. Federal agencies develop Environmental Assessments (EAs) to evaluate specific projects that are not expected to have significant environmental impacts. EISs are prepared for major federal actions that have the potential to significantly affect the environment. Large natural resource development projects typically involve preparation of an EIS.

NEPA mandates that federal agencies responsible for preparing EISs do so in cooperation with state and local governments (including tribal governments) and other federal agencies with jurisdiction by law or special expertise. Cooperating agencies assist the lead agency in developing the EIS. EISs for natural resource development projects will often include a number of agencies that are formally designated as cooperating agencies. The State of Alaska generally accepts cooperating agency status, with ADNR Office of Project Management and Permitting (OPMP) acting as the lead state agency in coordinating the input of other state agencies.

When the ADHSS HIA program develops an HIA for a project, ADHSS functions as part of the state interagency team that is coordinated by ADNR/OPMP. ADHSS brings its expertise to the team, along with the subject matter experts from the other state agencies, typically the departments of Natural Resources, Fish and Game, Environmental Conservation, Transportation and Public Facilities, and Commerce and Community Development.

Documentation
The purpose of NEPA is "to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man" (National Environmental Policy Act, 1969; Sec. 2 [42 USC § 4321]). The EIS is documentary evidence

that the requirements of NEPA have been satisfied.

Where the assessment of health impacts has been raised as an issue that needs to be addressed in the EIS, the lead federal agency may request that an HIA be developed to evaluate potential public health impacts. As discussed above, assessment of health using HIA methodology was included in several past EISs (Point Thomson, Red Dog Aqqaluk and NPR-A). An HIA was not developed for the more recent Greens Creek Mine Supplemental EIS. The determination of whether or not to evaluate health impacts and the methodology to do so is based on project-specific considerations.

Where an HIA is developed during the EIS process, the HIA may be a "stand-alone" HIA document to be included as an appendix to the draft or final EIS or it may be included in the Administrative Record as a reference. The federal agency, as the lead agency for developing the EIS, will make these decisions. "Stand-alone" means that the HIA remains as a single document that can be read from start to finish, with its own table of contents and internal logic and reference structure. EIS contractors can use the stand-alone HIA for technical information to inform the overall EIS or to create a specific health section within the EIS. The HIA program can also advise the EIS contractor how to interpret the HIA and integrate the technical information into its document.

Schedule

For a large natural resource or other infrastructure development project, the start of the NEPA public review process typically occurs when a federal agency publishes a notice of intent to prepare an EIS in the federal register. Prior to the notice of intent, a project proponent conducts a number of environmental studies in support of its initial application to a federal agency; much of these baseline data and analyses are used by the lead federal agency's EIS contractor for the analysis of potential impacts. During this period, some federal agencies may conduct a highly formal and public process, require submission of study plans, and hold public comment periods on the study plans. Other federal agencies allow this baseline period to unfold in an informal manner, without study plans or public review cycles, until the statement of intent is filed. If an HIA is also to be prepared for a project, it is important for the lead federal agency to request an HIA practitioner (e.g., the Alaska HIA Program, a private contractor, a tribal government or agency, etc.) and integrate the HIA and EIS processes as early as possible in the schedule. As such, the lead federal agency should work with the State in planning the HIA process before preparation of the notice of intent if possible. In addition, coordination of data collection activities to meet the needs of the EIS and HIA ideally occurs during the baseline data collection period. This typically involves early and frequent communication with the project proponent. This early coordination promotes cooperative planning of field studies and data gathering with other environmental baseline studies, which reduces survey fatigue in communities and the overall cost of field work, decreases the risk of delays, and provides an opportunity for health input into the creation of project "alternatives."

Assuming that the HIA is planned to be included as an appendix or reference for the EIS, a draft HIA should be available concurrent with publication of the draft EIS. If revisions are required, the revised HIA should be available along with the final EIS.

Recommendations

When completed, the HIA may provide recommendations that address the potential benefits and adverse impacts discovered during the study. Formal decisions regarding health recommendations, if any are identified, belong to the lead federal agency and would be included in the public health sections of the EIS. Ultimately, the federal agency decides

whether health impacts are significant, whether recommended actions are appropriate, and which actions, if any, are included as stipulations in a record of decision.

How does an HIA incorporate information from Economic and Social Impact Analyses?

An HIA relies, in part, on data from economic and social impact assessments and attempts to avoid duplicative research efforts whenever possible. Information from these assessments, such as income, employment, education, and local economic profiles is then used in the HIA to examine a series of health impacts known as the Social Determinants of Health (SDH). This will be described in further detail in Section 4.

What are the objectives of this HIA toolkit?

- To explain the general context and history of HIA in Alaska
- To suggest methodologies that assess potential community health impacts of resource development projects in the State of Alaska
- To help HIA programs or independent practitioners develop a scope of work and/or specific work plans
- To guide HIA practitioners in implementing an Alaska-specific best practices approach to performing field studies and stakeholder engagement activities, rating potential impacts, and making final recommendations
- To allow the inclusion of potential human health impacts during the social and environmental impact assessment process
- To define the roles and responsibilities of project proponents, HIA practitioners, and the State, in the overall health impact process

What are the limitations of this toolkit?

The toolkit does not address “inside the fence” workplace safety and health issues. The toolkit does consider “cross-over” issues where workforce behaviors produce interactions with local communities. The toolkit also addresses the benefits and risks of workforce influx such as off-duty recreation, leisure activities, housing needs, and economic benefits to the local community.

The toolkit currently focuses on natural resource development projects, rather than on general policy or program impact assessment. The toolkit could be updated or expanded to cover areas outside of natural resource development as program or policy health impact assessments are performed in Alaska.

This toolkit is not intended to replace or supersede established protocols, but is designed to establish a consistent framework for examining potential health impacts when these impacts are considered in existing regulatory or planning processes.

Who is the intended audience of the HIA toolkit?

The HIA toolkit is primarily intended as a technical resource for HIA practitioners, but was also designed to be a useful reference document for other stakeholders, including federal and state

regulatory agencies; local, state, tribal, and federal health agencies/departments; non-governmental entities; project proponents; and the public.

About This Document

Section 1 addresses a general background of the overall HIA practice. The critical role that the State of Alaska and the relevant tribal government health departments and tribal health organizations play in the overall process is described. General definitions of the different types of impacts (direct, indirect, and cumulative) within a health analysis are discussed.

Section 2 discusses how to decide whether to conduct an HIA. Some of the critical project features that can potentially produce health impacts are presented.

Section 3 describes the different types of HIAs. This section also discusses how to determine which type of HIA is appropriate for a given project.

Section 4 describes key health effect categories (HECs). These categories are similar to the environmental health areas (EHAs) concept that is widely discussed in the published international HIA literature. HECs are a key framework for organizing and analyzing the most likely types of potential impacts from a project. "Alaska-specific health effects" were developed as part of the collaborative work group effort.

Section 5 describes the scoping process for HIA, including how to coordinate the involvement of all relevant state agencies, and how to develop an appropriate work plan.

Section 6 considers the role of health-specific stakeholder engagement. Advance planning with the NEPA environmental and social teams to avoid duplication of effort is discussed.

Section 7 addresses baseline data collection and uses, including issues related to community surveys. The profound and ongoing baseline demographic shifts that are occurring in rural and urban Alaska are reviewed. The implications for positive or negative health impacts are considered. Available databases are presented along with their strengths and limitations.

Section 8 focuses on assessing and ranking health impacts and presents a standard qualitative model that is typically used in HIA. The section also describes the more quantitative aspects of chemical risk evaluation used by toxicologists and other health professionals.

Section 9 discusses how an HIA makes health recommendations, influencing the process for developing measures to avoid, minimize, rectify, reduce, or compensate for potentially significant impacts. Means to ensure that health prevention and promotion efforts are transparent, open, and considered throughout the overall HIA are discussed. The development of a Health Action Plan (HAP) is described including how the HAP may present verification processes to document success or failure in the achievement of key performance indicators (KPIs).

Section 10 provides a general discussion of monitoring and evaluation. The development of a reasonable and appropriate set of KPIs is a complex and difficult task that often requires technical assistance from the relevant public health authorities.

Section 11 focuses on the resources needed for conducting HIAs.

Section 1: General Background

Overview of HIA

This section of the toolkit introduces key terms, describes the HIA process, and explains the basic steps in an HIA. While many of these terms are useful for any type of HIA, this section is especially relevant to HIAs prepared for major natural resource development projects in Alaska.

Key Terms

Several key terms have a specific meaning in this guidance:

Health
For the purposes of this toolkit, health means "the reduction in mortality, morbidity and disability due to detectable disease or disorder, and an increase in the perceived level of health." This definition is from the World Health Organization (WHO) Regional Office for Europe "Health21" policy framework publication (WHO, 1999). As pointed out in this WHO publication, the WHO constitution in 1946 defined "health" as "*A state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity*." The 1946 WHO definition expresses an ideal that should guide all health development activities. But when it became clear that it was difficult to measure progress towards this ideal, WHO officials determined that they needed a narrower definition which recognized the difference between "aspirations" (striving for ideals of human health) and "operations" (striving to maintain and advance current human health status). The final phrase in the new definition still allows for the importance of one's perceived level of health.

Environmental Health
Environmental health is "the body of knowledge concerned with the prevention of disease through control of biological, chemical, or physical agents in the air, water, and food, and the control of environmental factors that may have an impact on the well-being of people." Environmental health encompasses the human living environment and stresses primary prevention based on engineering and design improvements (World Bank; Listorti, 1996).

This toolkit also understands environmental health to include human factors such as the social, economic, and physical context in which people live, work, and recreate. These environmental factors are referred to as the social determinants of health (SDH) and will be discussed in Section 4.

Impacts and Effects
"Impact" and "effect" are used interchangeably in this toolkit. Both beneficial and detrimental impacts will be considered, and they are usually classified into three types:

- **Direct** – an impact caused by an action and occurring at the same time and/or place
- **Indirect** – an impact that involves more than one causal step and often occurs later in time or farther removed in distance, but still reasonably foreseeable. In this toolkit, indirect impacts may arise from the way in which project features influence behavioral choices made by affected populations.
- **Cumulative** – caused by an action and when added to other past, present and

reasonably foreseeable actions, may become collectively significant over a period of time. Cumulative impacts must be confined to periods of time that can be estimated or predicted with reasonable accuracy to maintain meaning and provide a constructive function.

The following definitions have been developed for the National Environmental Policy Act (NEPA), but are also useful for health impact analysis because of the emphasis on place and timing.

Affected Environment
The "affected environment" as used in the NEPA process refers to an area where impacts may be created by the project and alternatives under consideration by the lead agency. The HIA toolkit will adopt the same alternatives as used in the NEPA process.

Significance
In a NEPA analysis, "significance" is a level of impact that is determined by a federal regulatory agency, taking into account the context and intensity of the proposed action, and which triggers certain requirements under federal law. "NEPA significance" is defined in federal regulations under 40 CFR § 1508.27.

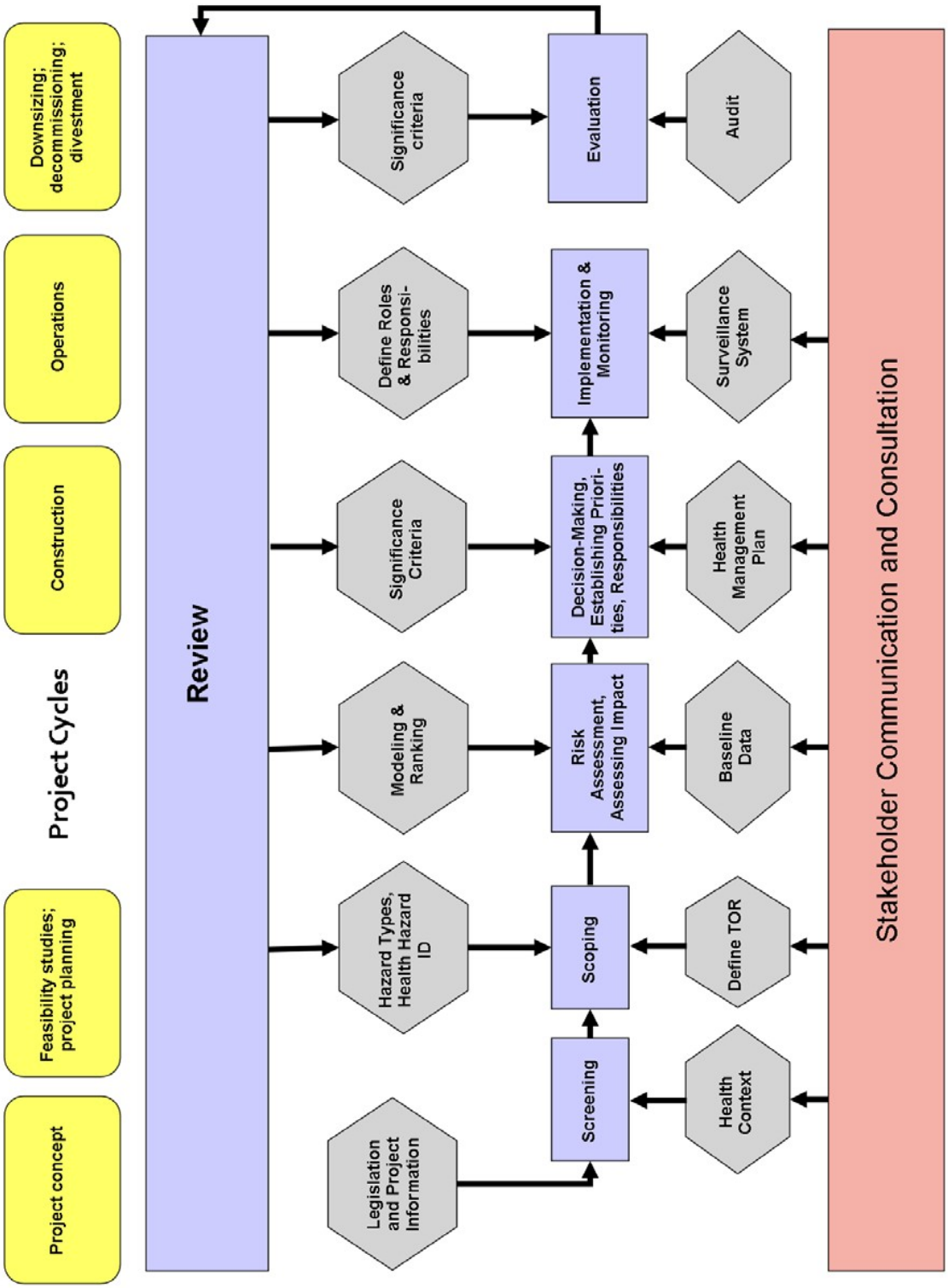
In the HIA document, however, "significance" has a broader meaning that is tied to recommendations in the HIA. Health impacts deemed to have a certain level of significance (usually Category 2 or higher, see Section 8) may act as a signal for the HIA practitioner, in consultation with the state agencies, to propose recommendations if relevant actionable recommendations exist. It is possible that a potential impact could be significant in the context of a stand-alone HIA, but not be deemed significant in the EIS under NEPA regulations.

Finally, it is important to underscore that the word "significance" as used in NEPA and HIA documents should not be confused with "statistical significance" used in scientific literature to describe the reliability of a statistical test result, which has a different meaning.

Social Determinants of Health (SDH)
The HIA toolkit adopts the CDC definition of SDH as "the circumstances in which people are born, grow up, live, work, and age, as well as the systems put in place to deal with illness. These circumstances are in turn shaped by a wider set of forces: economics, social policies, and politics." There are a variety of SDH models that are available including those from the WHO (2008).

HIA Process
The typical flow of the HIA process is represented in Figure 1.1 on the next page.

Figure 1.1 The HIA Roadmap (IFC, 2008)



In the HIA roadmap, the yellow "project cycles" blocks illustrate the typical phases of resource development projects. The elements of an HIA may or may not follow the timing of the project sequence. The orange bar entitled "stakeholder communication and consultation" illustrates that stakeholders should have input throughout the entire process (see Section 6 for detailed comments on stakeholder engagement). The beige boxes indicate key activities performed during the various steps of an HIA. The blue boxes in the center are the main steps of the HIA process, which include:

- **Screening –** Preliminary evaluation to decide whether a project poses any noteworthy health questions, whether an HIA is warranted, and if so, what size HIA is appropriate.

- **Scoping –** During NEPA scoping, a vast array of health issues of potential concern can be considered or examined through project review, health data review, and stakeholder engagement. All available and relevant baseline health data is also gathered and summarized during this phase. Baseline health data collection is described in greater detail in Section 7. Near the close of the scoping phase, the HIA practitioner should be able to identify finite plausible health impacts, if any, and any existing data gaps. Scoping is described in more detail in Section 5 and Section 6.

- **Impact Ranking –** After the key health impacts are identified during the scoping process, the impacts can be ranked. The HIA toolkit uses a semi-quantitative method that accounts for the intensity, geographic extent, duration, and likelihood of health impacts**.** (See Section 8)

- **Health Action Plan (HAP) –** Based on the impact rankings developed in the risk assessment, the HIA practitioner can develop an HAP that makes recommendations to address important impacts. These recommendations can suggest ways to further maximize the health benefits or minimize identified health risks. (See Section 9)

- **Implementation and Monitoring –** After the HAP is developed, key stakeholders (including the project proponents) may develop action frameworks, allocation of resources, and monitoring systems that track progress towards the goals of the HAP. The monitoring plan should define appropriate key performance indicators. (See Section 10)

Section 2: Screening—Deciding to Conduct an HIA

The Screening phase determines if an HIA is appropriate for a project and, if so, what level of HIA is needed (i.e., desktop, rapid appraisal, comprehensive; see Section 3). Screening is typically the first phase of the HIA process, which may happen through formal or informal conversations or may be captured in brief documents that explain the rationale behind screening choices.

Currently most HIAs are developed as part of the NEPA process for a specific project. The lead federal agency typically makes the decision whether an HIA is appropriate for the project, and how it should be incorporated into the Environmental Impact Statement. The goal is to ensure that a discussion of human health impacts is brought into the NEPA process, as appropriate, and ultimately an actual HIA may not be necessary.

How are screening decisions made?

The proposed project plan is reviewed for factors that are known to influence human health. Because resource development projects are extremely diverse; there is not a rigid set of screening rules for an HIA. Instead, this toolkit suggests a number of indicators that may point to the fact that an HIA is needed, such as project design features, environmental contaminants of concern, social concerns, or community concerns.

What resources inform HIA screening decisions?

Screening decisions are based on the best available knowledge about the project and the best available information on human health in the affected areas. If an applicant has produced an initial health review, this may be useful in the screening process, along with an initial project description. Widely accepted best practices in the field are reflected in *Improving Health in the United States: The Role of Health Impact Assessment (National Research Council, 2011)* and *Practice Standards for Health Impact Assessment* (North American HIA Practice Standards Working Group, 2009). Additionally, several industry trade associations (e.g., International Council on Mining and Metals [ICMM] and International Petroleum Industry Conservation Association [IPIECA]) have detailed screening chapters in the HIA guidance documents for their members.

What if a governmental agency contacts the HIA practitioner?

Typically, a governmental agency (usually the lead federal agency for the NEPA process) will decide to conduct an HIA prior to finding someone to perform the study. After reviewing the decision of the requesting agency, the next step for the HIA practitioner is to determine the level of effort required for the HIA by gathering key screening information about the project. This screening review should succinctly state the likelihood of potential impacts and propose whether additional analysis is required. Since HIAs are voluntary studies, it is possible that an HIA could be performed in the absence of regulatory frameworks.

What principles guide screening decisions?

The level of effort should be appropriate to the various aspects of the proposed project. Not all aspects of a project will necessarily require the same level of effort. The precise terminology that describes the level of HIA (i.e., desktop, rapid appraisal, comprehensive, see Section 3) is less critical than performing systematic and reproducible analyses. The agencies and the HIA practitioner should analyze every project using the same basic approach so that proponents and agencies can anticipate the steps and scale of the overall HIA process and plan accordingly. The screening process should be as transparent as possible.

What factors invite more in-depth health impact analysis?

The screening process reviews indicators that might include environmental, social, economic, and community concerns, as well as project characteristics.

Project characteristics

Prominent and new linear features with an emphasis on transport linkages

New linear features include airstrips, railway lines, power transmission lines, pipelines, roads, and rivers used as transportation conduits, where transportation conduits were not previously available or sufficiently developed. Linear features can create impacts because they allow new exposures between ecological and human communities, but can also bring significant benefits to the affected communities.

Impacts from new linear features are primarily related to increased access. New transportation routes can provide communities with greater access to medical and mental health facilities, educational and training facilities, and employment opportunities. Improved transportation also improves access to better and/or lower cost markets for goods and services and an increased range for subsistence activities.

Increased transportation access could also increase the potential for vehicular accidents and related injuries, expose communities to increased levels of dust and vehicle emissions, and provide new routes for the influx of alcohol and drugs. New travel routes could also change disease transmission patterns as workers stop in various communities along the route.

Linear features can also present physical barriers with the potential to change wildlife migration patterns, altering human accessibility to subsistence species. In some cases, linear barriers may also pose an impediment that limits human access within the region.

Large footprint facilities

Projects may require a large constellation of engineered facilities (e.g., tailings dams, ponds, roads, pipelines, and storage tanks) that are referred to as the physical footprint. For human health impacts, the project footprint may include communities affected by the movement of supplies and personnel, as well as locations where these entities interface with the public. The size of the project footprint is an important screening consideration.

Large projects in rural settings

When large projects occur in rural Alaskan settings the potential impacts are a complex mix. Large projects often bring substantial change to the economic, social, and physical factors that affect human health. These changes include local tax revenue, with subsequent effects on the overall standard of living, with monies potentially available for schools and new infrastructure. Personal incomes may also increase. The choices individuals make on how to spend their personal incomes are also complex; money may lead to increased drug and alcohol use, or it may enable the purchase of fresh produce and needed medications. A large project in a rural setting may also have profound effects on population in-migration, out-migration and family structure; opportunity for income may prevent families from having to separate in search of work, or it may bring increased pressure on local families asked to house distant relatives moving back into the region for work. The influx of new people into the communities may put increased pressure on existing local services, or it could mean an expansion of available services either directly provided by the project proponent or supported by new tax revenues.

Subsistence practices may benefit from increased access to subsistence use areas and financial resources for purchases of better transportation and hunting equipment. However, detrimental impacts to subsistence could include loss of subsistence use areas, animal avoidance of traditional use areas due to noise from a development project, and/or increased hunting competition.

The influx of a large workforce into a rural area can produce impacts as the new group of workers interfaces with small rural communities. Influx of new people may vitalize a community, or strain its services and infrastructure.

Project design and project policies may include measures to mitigate negative effects. Many rural facilities are fly in/fly out projects; employees are flown directly to the site and housed at the site to avoid any interface with the nearby communities. Additionally, rural projects often impose policies that prohibit hunting and fishing to minimize impacts of subsistence resources.

Local governance may also play an important role in how a development project impacts their communities. Zoning ordinances and policies for management of tax revenues will influence community outcomes.

Construction phase related influx

Potential impacts from the construction phase should also be examined in screening for an HIA. Construction activities may, in some cases, involve a greater influx of workers, and/or use temporary ‘camp conditions’ that differ from the operating project.

Exploration phase related influx

In general, exploration has the potential for health impacts related to access roads, helicopter noise, seismic activity, fuel storage, and personnel support.

In the typical rural Alaskan setting, the local population will be considered for employment or workers from other locations will be brought in via a fly in/fly out system. Exploration employees may be housed in remote camps or may utilize existing local lodges and other accommodations.

This may bring needed income to rural areas, particularly outside of the tourist season, and/or it may impose pressure on existing facilities and infrastructure. Some indirect impacts to the community could occur via influx of extended family job seekers.

In most cases, exploration activity occurs long before a project is defined for evaluation by an HIA, and is therefore not likely to be incorporated within a project HIA. Exploration, in and of itself, is unlikely to be of sufficient size and scope to warrant an EIS or an HIA.

Environmental concerns

Potential for hazardous material exposure

If a project has the potential to elevate human exposure to hazardous materials, this will usually indicate the need for a more in-depth HIA. The HIA practitioner should be aware that Alaska-specific exposure scenarios for chemicals are often different from those upon which federal standards are based. For example, rural residents eating a subsistence diet may be exposed to higher than expected levels of methyl mercury because fish constitutes a very large portion of their daily dietary intake. Consumption of fatty tissues from marine mammals (whale, seals, shark, and porpoise) is also common among Alaska Native peoples and may produce higher exposures to bio-accumulated compounds. This potential risk of elevated exposure levels may indicate a more in-depth environmental and human sampling for substances such as methyl mercury.

Air quality

Air emissions that are in compliance with permits are presumed to be protective of human health. Air quality issues associated with projects that may have unregulated emissions may invite the need for a more in-depth human health evaluation. For example, particulate deposition from fugitive dust that contains heavy metals or other potentially toxic substances may affect berries and other wild plants consumed in large quantities by local residents and subsistence species.

Water resources – quality, quantity and access

As with air, water emissions that are in compliance with permits are presumed to be protective of human health. Water access is a very important issue due the role it plays in subsistence issues, as well as community health and hygiene. Project features (e.g., dams, stream diversion, de-watering wells, drilling activities, etc.) that are likely to challenge water access or strain water delivery infrastructure may indicate the need for more in-depth health analysis. Also, projects can help to improve access to water. Many rural villages struggle to maintain adequate quantity and access to potable water supplies and depend heavily on clean water for their subsistence practices.

Subsistence resources, harvest, and practices

Project features that will affect subsistence resources are a key topic in rural settings that host Alaska Native communities. Subsistence concerns are cross-cutting because they affect the physical environment, social relationships, emotional well-being, and health behaviors. Projects that may influence key questions related to Alaskan subsistence practices are:

- **Quality** – Does the proposed project increase or decrease contaminant levels in subsistence resources (e.g., increased heavy metal concentrations)?

- **Access** – Does the proposed project limit or promote community access to subsistence resources for traditional user groups? Does the proposed project limit or promote access for new user groups, affecting competition for the resource?

- **Quantities** – Does the proposed project increase or decrease the quantity of the resources? Do changes in access benefit or negatively impact subsistence resource quantities?

Social Concerns

In addition to environmental concerns, some social issues may also identify the need for an in-depth HIA. Social analysis is often focused on these major areas:

Influx of workers or other individuals to a region

Influx can occur due to job seeking, commercial opportunities, small-scale trading, or extended-family in-migration. Significant influx may strain fragile local infrastructures, introduce new diseases, or disrupt social patterns, but could also revitalize a community where extensive outmigration has occurred due to a previous lack of employment opportunities. Increases in population can lead to the re-opening of schools that closed due to outmigration. The return of extended families can also reinstate traditional subsistence sharing practices, strengthen traditional practices, and strengthen familial bonds.

Screening decisions regarding the influx of workers should consider the size of the workforce, local hire commitments including training opportunities, and whether or not the work force will be housed at site on fly in/fly out basis.

Resettlement or relocation of villages or individuals

While unlikely in Alaska, resettlement and/or relocation can have significant direct, indirect, and cumulative health impacts. Impacts can vary from social and cultural disruption to changes in access to subsistence resources, for better or for worse. It is important for the HIA screening process to consider the distance and the characteristics of relocation. In circumstances where villages or individual homes are in areas subject to severe flooding or erosion, relocation may allow a village to maintain its functional existence within the region in lieu of outmigration to other villages and distant cities.

Economic concerns

Significant changes in income and expenditures for housing, food items, vehicles, and fuel may create a diverse array of positive and negative health effects. The range of potential effects is complex and very diverse. Projects that plan substantial recruiting from local populations may bring notable changes in income.

Equity

Equity involves the distribution of impacts for various community groups, identification of

potentially vulnerable populations, and identification of environmental justice (EJ) issues. EJ is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.

If screening and scoping indicates the possibility that there could be disproportionate health impacts or benefits to vulnerable populations, then an HIA may be useful to assess health effects. Federal agencies are required to address EJ during NEPA analyses. Council on Environmental Quality (CEQ) guidance recommends that federal agencies evaluate health and include an examination of relevant public health data as part of the EIS EJ analysis (CEQ 1997). EPA identifies HIA as a possible method for evaluating health in compliance with EJ requirements. While an HIA is not required to perform an EJ analysis, results of an HIA can inform the EJ analysis.

Community concerns

Strongly held community concerns may also serve as a reason for more in-depth HIA analyses. In many situations, especially concerning the fate and transport of potentially hazardous materials, stakeholders may voice concerns that arise from their experiences and perceptions. Regardless of the absolute validity of the concerns, it is important to provide information that reassures stakeholders that their issues will be addressed during the HIA. If strong community concerns overlap with a known gap in health data, this may be a reason to actively gather information from field studies or surveys.

Section 3: Types of HIAs

For this toolkit, the key descriptive terms for the types of HIA are:

- Desktop
- Rapid appraisal
- Comprehensive

Each type requires a different approach to baseline data collection and stakeholder engagement, and requires different amounts of time (see Table 3.1).

Desktop HIA

The desktop HIA is a qualitative assessment and is most appropriate for projects with few anticipated health impacts. The desktop HIA ideally requires two to four weeks and it often does not warrant extensive stakeholder engagement, although some engagement may be useful. If a screening study is warranted, the desktop HIA can be a useful tool for these purposes.

In a desktop analysis, the following elements should be covered:

- Project background
- Scope of the HIA
- Brief project description including (i) location, (ii) site access, and (iii) schedule
- Potentially impacted areas (geography)
- Potentially affected communities (if any)
- Review of available subsistence data
- Community and/or external stakeholder concerns or comments
- Brief baseline analysis
- Potential health benefits and effects
- Risk and benefit analysis based on the standard health effects categories
- Recommendations
- Monitoring options for Key Performance Indicators (KPI)

Rapid Appraisal HIA

A rapid appraisal HIA is more in-depth than a desktop HIA and uses available or accessible health information *without* conducting new field survey work. What differentiates a rapid appraisal HIA from a desktop HIA is the inclusion of stakeholder and key informant analysis, as outlined in Table 3.1. Examples of data sources for a rapid appraisal include peer-reviewed scientific literature, health department databases, and tribal health service data sources. The rapid appraisal will review the elements of the desktop HIA in more detail.

Comprehensive HIA

The hallmark of the comprehensive HIA is the collection of new field study data. Field studies address data gaps identified during the scoping process. A comprehensive HIA may be appropriate for large, complex projects that involve the following:

- Resettlement of existing communities
- Significant population influx
- Major disruption of subsistence practices
- Significant impacts, both positive and negative, to key SDH
- Information gaps related to a well-known aspect of a project

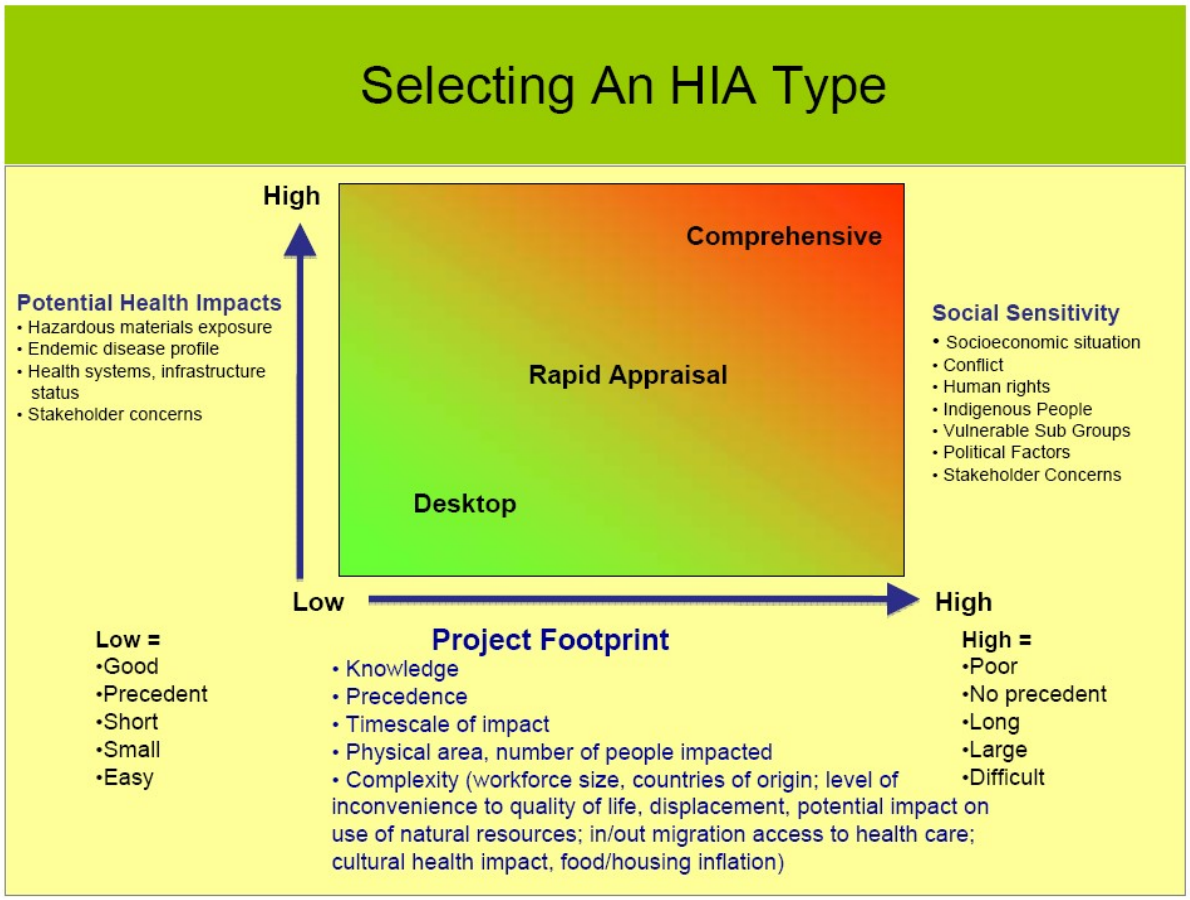
Table 3.1 Levels and Characteristics of HIAs

Level of HIA	Characteristics
Desktop HIA	Broad overview of possible health impacts Analysis of existing and accessible data No new data collection Usually takes an experienced assessor 2-4 weeks to perform the appropriate literature searches, analysis, and write-up
Rapid Appraisal HIA	Provides more detailed information of possible health impacts Analysis of existing data Stakeholder engagement, as warranted Stakeholder and key informant analysis No new data collection Typically takes a team of two experienced assessors 10-14 days in the field, followed by 4-8 weeks of analysis and document preparation, with literature (desktop) searches performed prior to the field work
Comprehensive HIA	Provides a comprehensive assessment of potential health impacts Robust definition of impacts Extensive stakeholder engagement New data collection Participatory approaches involving stakeholders and key informants Requires approximately 2-4 weeks of field work. In Alaska, community surveys often require a minimum of 4-6 months of pre-work to coordinate field studies with local communities. Field work in Alaska is heavily dependent on seasonal subsistence patterns.

How to Determine the Type of HIA

While there is no formal algorithm used to select the level of HIA, Figure 3.1 provides key factors to consider and a schematic for decision-making. As the size and nature of the project footprint increases, as the number of socially sensitive issues increases, and as the intensity of potential impacts increases, the level (desktop→rapid appraisal→comprehensive) of the HIA required increases. Projects that have just a few potential impacts, a small footprint, and few socially sensitive issues may be better served by a desktop HIA.

Figure 3.1 Selecting an HIA Type (IFC, 2008)



Section 4: Health Effects Categories (HECs)

A Health Effect Category (HEC) groups similar health effects so that they can be studied and discussed more easily. A health effect can be a health outcome (a documented health event, such as a clinic visit or the birth of an infant) or a health determinant (a social, environmental, or economic reality that influences health outcomes, such as education level or income). HECs supply the fundamental framework for scoping discussions and allow the HIA practitioner to systematically review each human health area in the light of a project design, a policy description, or a program description.

The HIA practitioner must always be mindful that the goal of the HIA for a resource development project, especially in rural Alaska, is to look at all possible health effects, both positive and negative. Resource development projects have the potential to bring significant positive benefits to a community if they are designed properly.

The table below presents a list of HECs that are relevant for natural resource development projects in Alaska. The HECs can be used for desktop, rapid appraisal, and comprehensive HIAs. It is important to note that the health outcomes and determinants in each category may be reduced (i.e., improved) or intensified (i.e., worsened) by the project.

Table 4.1 Health Effects Category Table

Health Effects Category	Pathway Description
Social Determinants of Health (SDH)	The SDH are the conditions in which people are born, grow, live, work and age. These circumstances are shaped by the distribution of money, power, access, and resources at global, national, state, regional, and local levels. The SDH are mostly responsible for health inequities -- the unfair and avoidable differences in health status seen within the state. This category reviews outcomes and determinants related to mental health, maternal and child health, substance use, social exclusion, psychosocial distress, historical trauma, family dynamics, economic status, educational status, social support systems, and employment status.
Accidents and Injuries	This category contains health outcomes and determinants related to accidents and injuries. The key outcomes considered are increases and decreases in intentional and unintentional injuries with fatal and nonfatal results. The key determinants in this category include items such as the presence of law enforcement, traffic patterns, alcohol involvement, distance to emergency services, and the presence of prevention programs.

Exposure to potentially hazardous materials	This category contains health outcomes and determinants that may arise from exposure to hazardous materials. The key health outcomes considered are increases and decreases in documented illnesses or exacerbation of illnesses commonly associated with pollutants of potential concern. These may be mediated through inhalation, ingestion, or physical contact.
Food, Nutrition, and Subsistence Activity	This category includes health outcomes and determinants related to food security, dietary choices, and the consumption of subsistence foods. The key health outcomes considered are nutrient levels, malnutrition or improvements in nutrient intake, and the subsequent increases or decreases in related diseases. The key determinants include diet composition, food security, and the consumption of subsistence foods.
Infectious Disease	This category includes health outcomes and determinants that result from infectious diseases. The key health outcomes include rates of increase or decrease for a range of infectious diseases, such as sexually transmitted infections (STI), respiratory illness, or skin infections. Important health determinants may include immunization rates, and the presence of infectious disease prevention efforts.
Water and Sanitation	This category includes changes to access, quantity, and quality of water supplies. Key determinants reviewed may include distance to clean water, water fluoridation, indoor plumbing, water treatment facilities, adequate volume of water resources, and the existence of community facilities, such as a washeteria and/or community showers.
Non-communicable and Chronic Diseases	This category includes health outcomes and determinants related to chronic disease. Important outcomes include increases or decreases in mortality and morbidity rates of cancer, cardiovascular and cerebrovascular diseases, diabetes, respiratory diseases, and mental health disorders. Key determinants for chronic diseases may include smoking rates, rates of alcohol and drug abuse, physical activity levels, presence of recreation centers, as well as cancer screening rates.

Health Services Infrastructure and Capacity	This category considers health outcomes and determinants related to health care access and health care infrastructure. Important outcomes include the increase or decrease in the number of medical evacuations, clinics or hospital visit trends, health expenditures, and medication usage. Health determinants may include distance to health facilities, medevac facilities/aircraft, the presence of community health aides, and the frequency of physician visits to the area.

Additional information on the Social Determinants of Health

It is widely accepted that human health is strongly influenced by a constellation of factors, such as political change, impoverishment, educational opportunity, family dynamics, historical trauma, and social integration. Social and health scientists often refer to these factors as "determinants" because their influence on health is so strong. The WHO definition describes the SDH as "the circumstances in which people are born, grow up, live, work and age, and the systems put in place to deal with illness." In rural Alaskan settings, communities often suffer from high rates of illness due to poor water quality and quantity, poor sanitation, inadequate shelter, indoor air pollution, limited access to appropriate medical care, and the inability to control exposure to infectious agents. Because these factors are complex and evidence may be sparse, it is important to make reasonable predictions about project effects on the SDH and to identify measurable outcomes.

Psychosocial Issues

The term psychosocial refers to social situations that produce psychological distress or psychological relief. Many adverse health behaviors are selected to cope with psychological distress just as many beneficial health choices are engaged during periods of psychological optimism and relief. In Alaska, poverty, rural isolation, urban isolation, cultural change, outmigration, historical trauma, and a host of other social factors can produce psychological distress. Project features should be reviewed with psychosocial issues in mind and overt sources of psychosocial distress should be identified. Some of the most challenging health issues for Alaskans are social and cultural changes that produce psychological distress resulting in adverse health behaviors (especially substance abuse and addictive behaviors) followed by depression and, in some cases, suicide. Psychological benefits are also important for project development as Alaskans realize opportunities for employment, economic growth, and personal development. There may be instances when a project's features clearly exacerbates or ameliorates a psychosocial issue and the associated health outcomes. The most common examples are community fear that a project will affect their subsistence foods and the hope that a new project will improve access to rural locations, lower costs of living, provide jobs, and improve economic status.

Individual Factors

Many SDH are strongly influenced by individual factors, such as genetic traits, lifestyle choices, and personal circumstances. Examples of individual determinants include gender, age, dietary intake, exercise patterns, alcohol and tobacco use, educational attainment, and employment. The causal relationship between a project and SDH for any given individual is very complex, but some level of causality can be predicted for subgroups within a community that share

certain individual traits (e.g., pregnant women).

Institutional Factors

Institutional factors refer to infrastructure and address the adequacy of public sector services, such as health care facilities, schools, transportation resources, sanitation, and communications infrastructure. It is especially important for the HIA practitioner to understand the project's potential impacts on the local health system since a large influx of workers can overwhelm already understaffed local health clinics, police departments, fire departments, emergency response services, and other critical public health and safety services. Positively, many large projects have their own internal medical services and have developed outreach programs with local clinics to benefit community health service delivery. In addition, projects can improve local economies, and one desirable outcome is better health care facilities and health program delivery. Finally, as part of their business practices, many project proponents encourage safe and healthy behaviors among their employees and these behaviors can serve as models for others in the workers' communities.

Section 5: Scoping—Developing an Appropriate Work Plan

HIA scoping identifies the HECs to be evaluated and should focus on the key health concerns related to the project. Scoping also establishes the geographical, chronological, and demographic boundaries for the HIA. Before scoping occurs, the HIA practitioner should obtain general knowledge of the project, including its location, size, workforce, affected communities, operations, and likely exposures. A field visit to the project site and surrounding communities is standard practice to provide context for the HIA practitioner. The scoping process may result in a scoping summary and an HIA work plan that clarifies what issues will be considered and how work will be completed.

If the HIA is being developed under an EIS, then the analysis (scope) of health effects is generally limited to those that are potentially significant. The scope will need to address not just the proposed action, but alternatives to the proposed action that will be subject to analysis in the EIS (NEPA requires that EISs include an analysis of the proposed action, no action alternative, and a range of reasonable alternatives to the proposed action).

HIA scoping can be done independently, but typically it occurs as part of the NEPA process. NEPA scoping for large natural resource development projects in Alaska occurs during the early stages of the NEPA process, with public scoping meetings arranged by the lead federal agency. The HIA practitioner should work with the state's large project team (lead by the Office of Project Management and Permitting) to coordinate with the lead agency to ensure that NEPA scoping is inclusive of HIA issues. In a joint NEPA/HIA scoping process, the HIA practitioner should attend agency and public scoping meetings to listen for comments that are related to human health. Not all comments are presented orally, so the HIA practitioner should also review public and agency comments that are submitted in writing. If an HIA is being conducted independent of the NEPA process, HIA-specific scoping can be conducted through separate stakeholder meetings following similar protocols to the NEPA scoping process.

It is very useful to organize scoping comments according to the HECs presented in Section 4. While some interpretation and judgment is needed, this approach quickly clarifies what HECs receive the most attention from stakeholders and agencies. For example, general comments about subsistence resources can be placed in the Food, Nutrition, and Subsistence HEC. This approach allows comments to be grouped together, summarized, and discussed more effectively.

Once the HIA practitioner has understood the project features and reviewed scoping comments, a systematic review of the key outcomes and determinants in each HEC is very helpful. This systematic review also identifies interdependencies with social, economic, and environmental study teams, and promotes collaboration.

Establishing Reasonable Limits on HIA Scope

A limited scope means that the HIA practitioner will not address every conceivable health effect. Instead, scoping highlights health effects that produce potentially intense impacts—with persistent duration and broad geographical spread—that are highly likely to occur. There should be a clearly-defined causal chain between the project and the anticipated health effect. The HIA should also acknowledge that community perception of the project (not just physical project features) may cause behavioral changes where none would otherwise exist.

Framing the Scope of the HIA

The HIA work plan should match the proportion of the anticipated health impacts and risks. A well-proportioned HIA allows health issues to be integrated into project planning in a timely and cost-effective manner. The HIA practitioner should consider the following questions as they create the work plan:

Will the HIA be a stand-alone document or integrated into an environmental impact statement?

Because HIAs follow a systematic methodology, an HIA should generally be developed as an independent stand-alone document. If an HIA is being developed in order to evaluate health impacts for an EIS, then the EIS will generally include sections on baseline health and potential health impacts of the proposed action and alternatives. The health sections in the EIS will draw upon the results of the HIA. The Federal Agency responsible for the EIS content may include the stand-alone HIA in the EIS as an appendix or it may be referred to in the list of references used to develop the EIS (as are other baseline and analytical reports used to support the EIS).

Does the HIA work plan adequately coordinate with the environmental and social assessment teams?

If an EIS is being conducted, there will be issues covered in the HIA that are interdependent with the social, economic, and environmental assessment teams. A chart of interdependencies between the various studies is a tool that can dramatically increase information sharing, reduce costs, reduce duplication of efforts, and reduce survey fatigue in communities.

For most resource development HIAs in Alaska, the HIA practitioner should collaborate with the state's large project team, which is led by the Office of Project Management, within the Department of Natural Resources. This team includes experts from all the relevant state agencies, including the departments of Natural Resources, Fish and Game, Environmental Conservation, and Health and Social Services.

Have the environmental, social, and health teams adequately mapped and selected the PACs and the geographical area of impact?

The HIA practitioner should understand and explain the different ways that the environmental, social, and health studies will describe the projected geographical scale of the project. The footprint and potentially affected communities (PACs) for the HIA may not always match the project footprint or the footprint of other studies.

During which stakeholder meetings will health discussions occur?

For projects that are engaged in the NEPA process, it is most efficient to hold joint stakeholder meetings for health discussions. This also reduces public burden and confusion that can arise from multiple meetings on a common project. The HIA practitioner should communicate with other project review teams and federal agencies if needed in order to join existing stakeholder meeting schedules where feasible. Joint meetings are highly encouraged, and should be the norm.

Has the HIA practitioner identified information gaps in documents

produced by the project proponent?

In the early stages of project planning, proponents will commonly provide tentative design information that may not specify important project features such as the location of construction camps, the layout of transportation corridors, or the movement of materials. The HIA practitioner should carefully understand when these plans will be formalized and how potential changes may influence the anticipated health impacts. The HIA practitioner must understand as much as possible about the final project design and operations, including permit stipulations, preventative practices, and the amount, handling, and fate of potential contaminants of concern, such as metals (e.g., lead and mercury) or toxic chemicals used in the extraction process.

Defining Potentially Affected (Impacted) Communities (PACs)

During the scoping process, the HIA practitioner must define the PACs and be careful to identify vulnerable subgroups within these communities. This process is subjective and should be coordinated with the NEPA environmental and social teams if the project is under NEPA review. A set of clear criteria often allow PACs to be identified in a systematic way and facilitates the development of zones of impact for the project. Some sample criteria for PACs are communities with the following:

- Close geographic proximity to the project
- Potential changes to water sources and quantities
- Locations in potential unpermitted release areas for contaminants of concern due to spills and other accidental releases (e.g., plumes)
- High likelihood for influx, resettlement, or relocation
- Intense work force recruitment potential
- Historic map data of subsistence activities in the project area
- High likelihood for change in key subsistence resources
- High likelihood for change in transportation infrastructure
- Potential for economic change including regional staging centers
- Existing large burden of diseases or health problems
- Existing large burden of psychosocial distress (e.g., high rates of suicide)
- Existing high level of exposure to an environmental hazard
- Rural communities already experiencing high rates of health disparities

Key Performance Indicators (KPIs)

Ultimately, scoping may identify a handful of high-priority health impacts specifically related to the project. This group of impacts often becomes known as the Key Performance Indicators (KPIs). KPIs must be measurable and it is ideal if they are easy to monitor on a regular basis. An experienced HIA practitioner will use the scoping period to create KPIs for later use, as needed.

Potential Partners for HIA Practitioners Working in Alaska

The HIA practitioner will benefit from good relationships with a variety of partners involved with the process. Federal and state regulatory agencies will almost always be involved, as well as

local governments at the regional (borough), city, and village level (e.g. village councils). Each entity has unique information about the project, the local environment, and cultural and traditional practices important for completing the HIA and other assessments. In Alaska, there are a host of federally recognized Tribal governments and Alaska Native tribal organizations and affiliations that can be engaged prior to conducting an HIA for a given project. The HIA practitioner should be very careful to involve relevant tribal governments and organizations in the HIA process and keep them regularly apprised of decisions and progress. Tribal governments and organizations are an additional source of public health and epidemiologic expertise, and often maintain specialized databases, disease surveillance programs, and health records that are frequently the only sources of information needed to characterize the baseline health status of affected populations. The North Slope Borough and the Municipality of Anchorage are the only two "local" health departments in Alaska. The North Slope Borough has its own HIA program.

The Alaska Native Tribal Health Consortium manages statewide health services for all Alaska Native people, and provides umbrella healthcare and public health services to communities in Alaska. Southcentral Foundation provides healthcare services for a wide range of Alaska Native people within the Anchorage service unit (including 55 rural communities surrounding Anchorage) and together with ANTHC, manages the Alaska Native Medical Center.

In each region of the state, tribal health corporations exist to provide medical and public health services for communities within their region. A list of existing health corporations/consortiums are provided in Table 5.1.

Table 5.1 Tribal Health Organizations

Alaska Native Health Board
Alaska Native Medical Center
Alaska Native Tribal Health Consortium
Alaska Tribal Health System
Aleutian Pribilof Islands Association
Annette Island Service Unit
Arctic Slope Native Association
Bristol Bay Area Health Corporation
Chickaloon Native Village
Chitina Traditional Indian Village Council
Chugachmiut
Cook Inlet Tribal Council
Copper River Native Association
Council of Athabascan Tribal Governments
Eastern Aleutian Tribes
Eklutna Native Village
Fairbanks Native Association
Kenaitze Indian Tribe
Ketchikan Indian Community
Knik Tribe
Kodiak Area Native Association
Maniilaq Association
Mt. Sanford Tribal Consortium
Native Village of Eyak
Ninilchik Traditional Council
Norton Sound Health Corporation
Seldovia Village Tribe
Southcentral Foundation
Southeast Alaska Regional Health Consortium
Tanana Chiefs Conference
Ukpeagvik Inupiat Corporation
Yukon-Kuskokwim Health Corporation

Section 6: Stakeholder Engagement

Stakeholder engagement is an ongoing process that is useful for both obtaining input from and providing information back to key project stakeholders. Stakeholders are persons or groups who are affected by a project, as well as those who may have interest in a project or the ability to influence its outcome. In particular, stakeholders may include locally affected communities or individuals, their formal and informal representatives, national, tribal, or local government authorities, politicians, religious leaders, civil society organizations, special interest groups, the academic community, or third-party businesses.

For projects undergoing a NEPA process, the HIA should be integrated with stakeholder meetings held by the proponent and the lead federal agency, as well as the NEPA environmental and social review teams whenever feasible. Generally, the lead federal agency facilitates structured public meetings that can easily accommodate HIA activities. Including HIA in these meetings mitigates 'meeting fatigue' in communities. If possible, the HIA practitioner should avoid creating separate stakeholder engagement processes exclusively for health. For smaller projects, it may be reasonable to gather stakeholder input from public meetings or documentation of public comments.

The objectives of stakeholder engagement and public participation include:

- Providing project information and health information to stakeholders
- Obtaining public input on the nature of health risks and benefits posed by the project, and possible locally relevant solutions
- Ensuring that the analysis of potential impacts proceeds in a public, transparent and unbiased manner
- Obtaining information regarding local and traditional knowledge, scientific data, and other sources of information that may be available to contribute to a more complete HIA
- Building trust and collaboration between stakeholders
- Ensuring equal opportunities for participation by all stakeholders
- Refining stakeholder expectations about the scope of the HIA, its voluntary nature, and the discretion of agencies to implement (or not) HIA recommendations

The HIA should be conducted in a publicly transparent manner, with opportunity for public comment on:

- Scope of concerns to be addressed to be addressed through:
    - Scoping meetings
    - Written comments
    - Review of the draft scoping report
- The draft HIA including
    - Projected impacts on public health
    - Potential prevention and mitigation measures to address impacts
    - Monitoring and evaluation strategies
    - Recommendations

For projects under NEPA review, scoping and document reviews should be coordinated with the NEPA process, ideally with the state large projects team led by the Office of Project Management and Permitting. Every effort should be made to avoid duplicative community meetings as stakeholders can experience "consultation fatigue" just as easily as "survey

fatigue." One common approach to engaging stakeholders that can help avoid the problem of consultation fatigue is the use of an advisory committee comprised of representatives of key community organizations, industry, and other stakeholder organizations. Advisory committees can improve the quality and specificity of the analysis; help ensure that recommendations address community needs within the technical, financial, and legal limitations of the proposed action; and provide an efficient means of communicating results to key audiences. However, if used, such advisory committees must be carefully designed in collaboration with the other agencies.

Methodology

Due to the diverse projects and associated stakeholder groups, there is no single best method for conducting stakeholder engagement. Table 6.1 details the typical activities for stakeholder involvement when performing an HIA within the NEPA process.

Table 6.1. Common stakeholder engagement activities during an HIA

HIA Components	Stakeholder engagement activities
Screening	▪ Identify stakeholders ▪ Review documented stakeholder concern ▪ Meet with key stakeholder groups to identify health issues related to the proposed project
Scoping	▪ Attend scoping meetings with the EIS team (where stakeholders are provided information about the proposed project and are requested to provide comments) ▪ Document health issues identified by stakeholder during the scoping meetings ▪ Create a summary of health issues by health effect category ▪ Attend cooperating-agency meetings (where applicable federal, state, tribal, and local agencies provide input into the development of the EIS) ▪ Solicit stakeholder review and approval of health data summaries from fieldwork, if applicable ▪ Update stakeholder groups on HIA progress, especially regional and tribal health organizations
Impact Ranking	▪ Attend cooperating-agency meetings ▪ Update stakeholder groups on HIA progress ▪ Obtain data from relevant stakeholder groups (e.g. traditional knowledge, air quality, water quality)
Health Action Plan	▪ Attend cooperating-agency meetings ▪ Update stakeholder groups on HIA progress

Implementation and Monitoring	▪ Present the findings of the HIA in the PACs ▪ Collaborate with relevant stakeholders to implement proposed monitoring activities, if applicable ▪ Collaborate with relevant stakeholders to collect data on selected KPIs ▪ Meet with stakeholder groups, as appropriate, to gather information on the results of the HIA

Upon the completion of the HIA, stakeholder engagement continues with public review of the document as it is included in the EIS. Stakeholders have the opportunity to comment on the draft HIA during the public review period for the draft EIS. The HIA practitioner will respond to the substantive comments and release a final version of the HIA when the final EIS is complete.

Cultural Considerations

Timing is essential to avoid conflicts between stakeholder meetings and subsistence activities and other community events. Careful coordination can enable attendance and participation in most cases. Participation improves when planners make attendance as convenient and enjoyable for the community as possible; as such, providing food, door prizes, and childcare can enhance attendance. It can be very useful to provide translators, particularly to enhance communication with elders that may not be fluent in English. This consideration should extend to advertisement of and written materials for stakeholder meetings. Since many local languages were not originally written languages, verbal communication in the native language is most effective.

Additional coordination with stakeholders in Alaska Native communities should be exercised in advance of significant stakeholder engagement activities. Many Alaska Native communities have a long history of being continually researched by various federal and state agencies and academic institutions. Some of this research has led to trauma within the communities and mistrust of research activities. The HIA practitioner should work with the community to build and maintain trust in the stakeholder process. If possible, the HIA practitioner should identify a contact, such as the director of the local health clinic, who can assist in identifying strategies to prevent additional trauma to participants during the stakeholder engagement process.

Participation

The geographic isolation of rural Alaskan communities, language barriers, seasonal subsistence activities, and the sheer number of small communities affected by large projects can frustrate efforts to coordinate meetings. Summer is a very challenging time for meeting with rural communities because many have departed for fishing or hunting opportunities. Winter can create transportation challenges in remote Alaska. Often, the shoulder seasons just prior to summer and just before winter are good times to coordinate visits with rural Alaskan communities. Every effort should be made to incorporate HIA-related community engagement with the existing public noticing and meeting processes used for environmental and social impact assessments of resource development projects.

Section 7: Collecting and Reporting Baseline Data

Collecting and reporting baseline data is usually the first major analytic task for the HIA practitioner. The HIA practitioner should obtain as much data as possible regarding each high-priority issue identified (see Section 5). In many situations, careful literature searches, review of governmental (i.e., federal, state, tribal and local) and tribal information systems, and consultation with key stakeholders are sufficient. Occasionally, there are key data gaps that must be addressed through the collection of baseline field data (e.g., nutritional surveys). The data collection efforts should match the complexity and practical needs of the HIA and should avoid devolving into an academic exercise. It is always important to think about why the data need to be collected, how the data is relevant to the project, how the data relates to the overall final analysis of a project, and potential ramifications of the collection methodology on PACs. Data collection should also consider studies that will provide information in a manner that supports meaningful comparative analysis over time. Links to a large body of relevant health data organized by HEC may be found at www.epi.alaska.gov/hia/data.htm. Table 7.1 presents some examples of key information sources in Alaska.

Data collection for the HIA should begin as early as possible. For a typical resource development project in Alaska, baseline data collection may start many years before permit applications are actually submitted to the agencies, and before the NEPA process starts. The project proponent usually starts working with the state large project team with the Office of Project Management and Permitting during this pre-application phase. The HIA practicioner should be involved as early as possible so that they can coordinate the HIA baseline data collection with the efforts of the other agencies.

Table 7.1 Key Sources of Health Information in Alaska

- Published public health studies (literature review)
- State public health surveillance:
  - Reportable illnesses
  - Vital statistics
  - Alaska trauma registry
  - Health Facilities Data Reporting Program
- Tribal health databases:
  - Cancer registry
  - Diabetes registry
  - Trauma database
- Hospital health records:
  - Resource and Patient Management System
  - Cerner
- Other sources of health-related information:
  - Uniform crime reports
  - Family violence reporting
  - Community subsistence information system

Guidelines for Human Health Data Collection and Use

Unlike the collection and reporting of environmental data, the collection and use of human health data is governed by strict legal and ethical codes. This is especially true when accessing federal, state, local or tribal databases or collecting new health information in the field.

The HIA practitioner must be aware of local specifics related to health information and be prepared for the protracted timeframe required in obtaining institutional review board (IRB) approval for human subject research projects. In many cases, the difficulty, cost, and privacy concerns generated by human subject research means that only the most significant health issues will receive this level of investigation.

Most of the published public health surveillance reports in Alaska provide data at the statewide or regional level, but not at the village or community level. One reason for this is that health challenges can stigmatize rural Alaskan communities--this must be avoided at all costs. Another reason for limited data availability is that statistical validity is often not achieved at the village level since the numbers of cases for a given outcome are usually small. The State of Alaska does not release disaggregated results if the number of cases is less than six. In some cases, this situation can be remedied by creating zones of impact around a project and aggregating data from each zone. Zones increase the sample sizes involved, protect the privacy of individual communities, and provide useful information to the project proponent as well as regional health authorities.

In cases where low numbers or other concerns prevent public disclosure of baseline illness rates, it may be possible to obtain certain baseline data through collaboration with local or tribal health entities. Even if information cannot be reported publicly, the new baseline data collected can aid disease surveillance and service planning by municipal, tribal and state health agencies.

Many rural Alaskan communities contain a high percentage of Alaska Native peoples and these communities often track health information in a centralized computer database. In general, approval from tribal communities is required to access these records. *Under no circumstances may individually identifiable health information be included in any document related to a HIA.* HIA practitioners may need to review personal medical records in order to understand some disease conditions. Personal health information is protected under the federal Health Insurance Portability and Accountability Act (HIPAA), as well as applicable Institutional Review Board (IRB) guidelines (45 CFR Part 46), and institutional policies in the hospital, clinic, or other facility in which the records reside.

The U.S. Department of Health and Human Services (DHHS) has developed regulations that assure the protection of human subjects from research risks (45 CFR Part 46). The purpose of an IRB is to protect the rights and welfare of human subjects, to protect privacy, and to ensure that human data are used ethically and responsibly. It is often difficult to determine whether specific public health activities are subject to 45 CFR Part 46, because they cannot unambiguously be classified as either research or non-research. Guidelines and decision charts are provided by DHHS to assist public health practitioners in determining whether 45 CFR Part 46 regulations apply to specific activities occurring at the boundary between public health practice and research, such as data collection for HIAs. When in doubt, it is best to consult with the appropriate jurisdiction's IRB to request their assistance in classifying the

project to ensure compliance with both the letter and spirit of 45 CFR Part 46. For projects involving tribal members as research subjects, the Alaska Area IRB is the appropriate entity to review research and data collection protocols.

In all cases, the HIA practitioner must work closely with ADHSS to identify the legal and ethical restrictions on collecting, evaluating, and reporting health statistics. As a general rule, collaboration with municipal, tribal, and state governments and health agencies is essential to ensure that health data are used in an appropriate manner.

Baseline Data Activities and Tasks

While each project is different, baseline data collection often occurs before proponents specify the design features for their project. Experienced HIA practitioners develop a standardized approach to baseline data collection. Again, the social and environmental review teams often produce baseline data that will be very useful to the HIA practitioner. In addition, these teams often perform survey work that can also be timed with HIA surveys during a comprehensive HIA.

Data Gaps Analysis

After the key baseline data have been reviewed, the HIA practitioner will need to assess if there are significant data gaps. This is a critical exercise so that a coherent and cost-effective plan for closing critical gaps can be created. Experience in Alaska indicates that several data gaps are likely to emerge, shown in Table 7.2. Further guidance for nutritional surveys and biomonitoring is contained in Appendix 4.

Table 7.2 Common Data Gaps for Alaskan HIAs

Data Gap	Potential baseline studies
Community morbidity patterns	• Discussion with local clinic staff • Review of a representative random sample of medical records • Body mass index measurements
Subsistence consumption	• Baseline nutritional surveys • Baseline food security (via representative survey)
Baseline contaminant levels	• Baseline study of contaminants in subsistence foods and in humans who consume the resource

Subsistence Issues

Most of rural Alaska sustains a "mixed, subsistence-market" economy, wherein families invest money into small-scale, efficient technologies to harvest wild foods (ADF&G, 2000). In the non-urban areas of the state, many households depend on a mix of cash, subsistence (hunting, fishing and gathering), sharing, and non-cash trading. Potential impacts, either positive or negative, on subsistence resources can have large and persistent impacts on community health.

For Alaska Native peoples, subsistence is more than the harvesting, processing, sharing, and trading of marine and land mammals, fish, and plants. Subsistence embodies cultural, social, and spiritual values that are the essence of Alaska Native cultures (Braund, 2010). In addition, subsistence fishing, hunting, and gathering are important sources of nutrition and non-traditional employment in almost all rural communities. The Alaska Federation of Natives (AFN, 2010) describes subsistence as:

> "the hunting, fishing, and gathering activities which traditionally constituted the economic base of life for Alaska's Native peoples and which continue to flourish in many areas of the state today. ... Subsistence is a way of life in rural Alaska that is vital to the preservation of communities, tribal cultures, and economies. Subsistence resources have great nutritional, economical, cultural, and spiritual importance in the lives of rural Alaskans. …Subsistence, being integral to our worldview and among the strongest remaining ties to our ancient cultures, is as much spiritual and cultural, as it is physical."

According to Braund (2010), full-time, year-round wage employment has affected the pursuit of subsistence resources, both positively and negatively. It has positively affected the subsistence hunt by providing cash for snow machines, boats, motors, fuel, equipment, and ammunition required for the hunt. Negatively, however, full-time year-round employment limits the time a subsistence hunter can spend hunting to non-work hours (although often the subsistence hunter can share his or her equipment and resources with other family or community members). Remote employment may further limit the pursuit of subsistence resources, as hunters may be away working during the best times for harvesting in their home region. During midwinter, this time window is further limited by brief daylight hours. In summer, extensive hunting, fishing, and gathering activities can be pursued during non-work hours without any light limitation, but travel away from the road and trail system, without the advantages of snow travel, is limited to raised ground and waterways.

Employment policies should be reviewed to determine if work schedules and leave policies provide opportunities for subsistence activities; some remote natural resource developments work on a rotational basis that may allow for greater subsistence activity than more typical schedules.

EISs for natural resource development projects in Alaska include sections that evaluate baseline subsistence and impacts to subsistence from the project and alternatives. When a project is under NEPA review, the HIA practitioner should coordinate with the EIS team to incorporate the EIS team's subsistence data and analyses into the HIA. Impacts to subsistence may be positive, negative, or mixed. The HIA practitioner must consider how subsistence issues interact with the proposed project location, size, linear features, and number and variety of communities in reasonably close proximity to the project. Both direct and indirect impacts to subsistence must be considered during HIA baseline data collection planning.

Direct Impacts

- **Access** – If a project either limits or increases access to subsistence resources, this should be reviewed by the HIA practitioner. Economic growth and new access routes such as transportation corridors may increase the number of individuals (some from very distant communities) competing for a resource in a given area; it may also improve local access resulting in a net benefit to local subsistence users. Baseline data collection can confirm harvest patterns and stakeholder engagement can clarify subsistence practices before the project is implemented. NEPA environmental teams may also place great emphasis on access to subsistence resources. For projects under NEPA review, the HIA practitioner should utilize information collected by the NEPA environmental team to determine effects to human health and collaborate with the NEPA team to determine if additional data collection is warranted.

- **Quantity** – Project features that change the quantity (i.e., the number, size, and/or species) of a common subsistence resource are usually evaluated by the EIS team if the project is under NEPA review. For example, will the physical footprint (e.g., river diversion) of the project change the absolute number or size of certain critical fish species (e.g., salmon or pike) that support subsistence practices in local communities? Will the project include improvement projects such as habitat enhancement, fish hatcheries, or water treatment that minimize or improve subsistence resource numbers? The HIA practitioner should review these NEPA analyses to determine affects to human health.

- **Quality** – Project discharges may also change the quality of a resource or overall well-being of the resource. The HIA practitioner should understand the fate-transport pathways of potentially hazardous materials at the project location. Typically, a conceptual site model is created that describes how materials move in the environment and at what point subsistence resources may be affected. Prevention measures such as collection systems and containment should be incorporated into the evaluation.

  Quality can be affected by biomagnification, the process by which a substance builds up in the tissue of organisms in an ecosystem, such that the highest concentrations are found in the species at the top of the food chain. Large marine mammals in some areas of Alaska (e.g., whales, seals, otters) and certain freshwater fish (e.g., pike, Burbot) are examples of species that may accumulate toxins, such as mercury and polychlorinated biphenyls (PCBs). Tissue analyses of contaminants in marine mammal tissues are helpful for determining present vulnerability and provide a baseline for future comparative evaluations.

If the project will affect access and quantity or quality of a resource, the HIA practitioner may be directed to collect baseline nutritional data using dietary surveys. The point of a nutritional survey is to determine which foods are eaten and what relative quantities are eaten in a given region. The results of the survey should indicate the extent to which specific subsistence foods are relied upon for basic food security (quantity) as well as nutritional adequacy. Nutritional surveys focused on subsistence diets are one of the most common measures taken to address data gaps for Alaskan HIAs.

Indirect Impacts

The analyses of indirect impacts can be especially complex for subsistence issues. As a simple example, the presence of a development project may lead to rising incomes in a community, which may precipitate a variety of interrelated but independent choices for various members of the community. Some may use their improved economic standing to increase their engagement with subsistence living through the purchase of improved transportation and harvest equipment. Others may choose to use their new economic status to purchase prepared food from local sources and eat less subsistence foods, or to purchase healthy foods such as fresh produce to supplement their subsistence resources. The presence of individual choices renders this scenario an indirect impact.

Before drawing conclusions about subsistence impacts, the HIA practitioner must arrive at a contextual understanding of regional subsistence patterns without regard to a specific project. In order to understand this context, baseline nutritional surveys and the selection of control (comparison) regions can provide valuable information. In cases where a specific subsistence resource could be substantially affected by a project, a plausible causal chain, appropriate baseline information, comparison data, and documented shifts in consumption or harvest can be used to tie potential impacts to the project, making sure to weigh and qualify any conclusions according to the unique features and policies of the proposed project.

If a baseline nutritional survey is needed, it is a very important documentary tool for this portion of an HIA. Baseline nutritional surveys should be developed in collaboration with the community, if possible. A baseline nutritional survey can establish the proportion of the local diet that is drawn from a subsistence resource before the project is implemented. Nutritional surveys can also correlate subsistence consumption with baseline environmental hazards such as methyl mercury through noninvasive sampling. If future nutritional surveys are funded and coupled with a plausible causal chain of events, and if they demonstrate differences in subsistence consumption, a stakeholder or project proponent can address the issue based on concrete baseline information.

In addition to documenting overall change, baseline nutritional surveys provide a profile of the whole diet and reveal what foods replaced the subsistence food in question. Communities may purchase more store-bought food, or they may be choosing another subsistence resource that is more available. A baseline nutritional survey allows the project team to answer many of these critical questions about indirect impacts to subsistence resource use. Ultimately, baseline information reveals if the community is able to adapt to the change in a healthy way, or if additional measures are required to ensure that the dietary health of the community is protected.

Cumulative Impacts

Cumulative impacts on subsistence resources should be considered by the HIA practitioner. For example, if there have been many long-term industrial projects in the area, contaminants in subsistence resources could accumulate. Adequate baseline studies, especially nutritional work, will help document such effects as required. Though this scenario will be evaluated by the environmental team (cumulative impact analysis is required for EISs), the HIA should also consider it in a health and psychosocial-specific context.

Section 8: Impact Assessment – Rating and Ranking Health Impacts

What is a health impact?

A health impact is a positive or negative change in a health outcome or a health determinant (Section 4). The HIA practitioner should use precise language to formulate health impacts that promote clear thinking about causal factors, rating and ranking decisions, as well as potential health recommendations.

First, health impacts should reflect human health outcomes or determinants, rather than environmental conditions. For example, an impact stated as "increased road dust levels" is not a health impact, but rather an environmental impact. The health impact would be a health outcome related to dust exposure stated as "increased clinic visits for asthma exacerbation at clinic A." This means that HIA practitioners will use medical, social, and economic language to describe specific disease states or the health benefits that might arise from a project.

Second, health impacts should reflect specific outcomes or determinants. For example, an impact stated as "increase in respiratory disease" is typically too general to be useful in an HIA. As such, it would be better to state the impact as "increased incidence of lung cancer" or "increased incidence of chronic obstructive pulmonary disease."

Third, health impacts should reflect effects that are as readily quantifiable as possible. For example, an impact stated as "decreased incidence of depression-related visits at the Village A Clinic" is more readily quantifiable than "decreased depression in rural communities." Quantification or semi-quantification may occur through biomonitoring, public health surveillance systems, community interviews, or approved chart reviews.

The HIA will ultimately make recommendations on how the positive health impacts can be maximized, and how the negative health impacts can be minimized. However, the HIA assumes that a permitted project will operate as designed, in compliance with permit stipulations and standards.

Using Health Effect Categories to Create a List of Health Impacts

During the scoping phase, the HIA practitioner uses the eight health effect categories (HECs) from Section 4 to systematically consider a wide range of potential health impacts. This range of health impacts is further narrowed to a list of important health impacts to be considered in the impact assessment phase.

During rating and ranking, the HECs in Section 4 remain very useful for creating and listing health impacts. There are key outcomes and determinants in each HEC that can be reviewed during the rating exercise and the HIA practitioner can carefully state a handful of the most important health impacts to be considered. A list of specific and observable health impacts that are organized by HEC provides a very intuitive approach to impact rating.

What are the Dimensions of a Health Impact?

Health impacts may have several different dimensions and impacts may be positive or negative. The dimensions of an impact include:

- **Importance** – how important is the impact to the potentially affected communities and other stakeholders, including applicants?
- **Nature** – is the impact direct, indirect, or cumulative?
- **Duration** – when will the impacts occur and how long will they last under typical conditions?
- **Extent** – how widespread will the impacts be under likely conditions (e.g., statewide, regional, or local) and will there be groups with disproportionate impacts?
- **Magnitude** – what is the range of intensity of the impact in terms of change from existing baseline conditions?
- **Frequency** – how often would the impact reasonably occur during a specified time period?

The rating approach suggested in this section also incorporates health effects (i.e., beneficial or harmful health consequences that are expected to occur in impacted communities as a direct result of the project). In order to score a health effect, the rater must make an educated estimation of the likely magnitude and directionality (i.e., beneficial or harmful) of the health effect on the affected population. For example, in order to rate (i.e., quantify the relative magnitude of) the impact "increased visits for asthma exacerbation at clinic A", the HIA practitioner would need to forecast the extent of increased incidence in asthma exacerbation that may occur.

In the health effects column of Figure 8.1, health effects that can be imagined but would probably not be perceived by people or detected by monitoring are characterized with an impact level of *low*. Health effects with a score of 1 are generally effects that would be readily perceived by people or detected by surveillance and monitoring efforts, but would be primarily a nuisance and would not exceed current exposure limits or markedly change disease patterns for humans. Health effects with a score of 2 are those that would markedly increase or decrease illness and injury rates and may require interventions, if negative. Health effects with a score of 3 are those that would markedly increase or decrease mortality rates or cause large and notable changes in disease rates, and may necessitate interventions, if negative.

Figure 8.1 Step 1 of a Four-Step Impact Assessment Matrix

Step 1				
	Impact Dimensions			
Impact Rating Score	A – Health Effect (+/-)	B- Duration	C-Magnitude	D- Extent
0	Effect is not perceptible	Less than 1 month	Minor	Individual cases
1	(+/-) minor benefits or risks to injury or illness patterns (no intervention needed)	Short-term: 1-12 months	Those impacted will 1.)be able to adapt to the impact with ease and maintain pre-impact level of health, 2.) see noticeable but limited and localized improvements to health conditions	Local: small limited impact to households
2	(+/-) moderate benefits or risks to illness or injury patterns (intervention needed, if negative)	Medium-term: 1 to 6 years	Those impacted will: 1.) be able to adapt to the health impact with some difficulty and will maintain pre-impact level of health with support, or 2.) experience beneficial impacts to health for specific population some maintenance may still be required	Entire Potentially Affected Communities (PACs); village level
3	(+/-) severe benefits or risks: marked change in mortality and morbidity patterns (intervention needed, if negative)	Long-term: more than 6 years/life of project and beyond	Those impacted will 1.) not be able to adapt to the health impact or to maintain pre-impact level of health 2.)see noticeable major improvements in health and overall quality of life	Extends beyond PACs; regional and state-wide levels

Impact Assessment: How Can Health Impacts Be Rated?

Potential positive and negative impacts can be rated using semi-quantitative approaches. The HIA practitioner benefits from impact ranking because it allows the practitioner to prioritize elements of the action plan. There are many rating approaches (an example is included below for illustration purposes only). HIA practitioners may use a variety of rating schemes, but they should be clearly explained for the purposes of transparency and collaboration. There are four steps to the sample impact rating process below (Figure 8.1 is used for Step 1, and Figure 8.2 is used for Steps 2-4).

For illustration purposes only, suppose a project footprint requires a gravel road near a small community and the project plan predicts a modest increase in road dust. While road dust is the environmental impact, the HIA practitioner states the health impact as "increased visits for asthma exacerbation at Clinic A" and begins the rating process (there are other impacts to be reviewed such as noise, traffic accidents, and the benefits of community access).

In Step 1 (Figure 8.1), the **health effect** of the impact "increased visits for asthma exacerbation at clinic A" would be **negative** and have moderate risks to health that could require an intervention (e.g., acute and ongoing therapy for asthma). In Figure 8.1, this corresponds with a score of 2 points. Next, the **duration** of the impact would be for the life of the project and so it would receive a score of 3. Next, the practitioner would consider the **magnitude** of the impact, which would be 1 point since a modest increase in road dust would not affect health status and individuals would probably be able to adapt using interventions. The **extent** of the impact would probably be limited to households near the road giving this impact 1 point for its localized extent. The overall score for Step 1 would be *negative* seven (health effect **2** + duration **3** + magnitude **1** + extent **1** = **7**).

For Step 2, the score from Step 1 is used to find the appropriate impact level range in the left column of Figure 8.2 below. For this example, the "increased visits for asthma exacerbation at Clinic A" impact had a Step 1 score of -7, and so the practitioner would select the 7-9 row in Figure 8.2.

Figure 8.2 Steps 2, 3, and 4 of Four-Step Impact Assessment Matrix

Step 2	**Step 3**						
Impact Level (Use Score from Step 1 to choose range)	**Likelihood Rating**						
	Extremely Unlikely (<1%)	**Very Unlikely (1-10%)**	**Unlikely (10-33%)**	**About as likely as Not (33-66%)**	**Likely (66-90%)**	**Very Likely (90-99%)**	**Virtually Certain (>99%)**
1-3	♦	♦	♦	♦	♦♦	♦♦	♦♦
4-6	♦	♦	♦	♦♦	♦♦	♦♦	♦♦♦
7-9	♦♦	♦♦	♦♦	♦♦♦	♦♦♦	♦♦♦	♦♦♦♦
10-12	♦♦♦	♦♦♦	♦♦♦	♦♦♦♦	♦♦♦♦	♦♦♦♦	♦♦♦♦
Step 4	**Impact Rating**						
	Category 1 = ♦ Category 2 = ♦♦ Category 3 = ♦♦♦ Category 4 = ♦♦♦♦						

Once the appropriate impact level row is selected during Step 2 (in the example: 7-9), the rater uses **only that row** of values to complete Step 3, which is the likelihood rating. Moving from left to right along the row of likelihood ratings, the rater will make an informed judgment about the likelihood of the impact. For the example, suppose the rater believes the likelihood of "increased visits for asthma exacerbation at clinic A" to be "unlikely" (10-33% chance of occurring). In the score 7-9 row above, "unlikely" corresponds with the result of two diamonds (♦♦). Step 4 provides a value for the result from Step 3, and the overall ranking for the impact "increased visits for asthma exacerbation at Clinic A". In our example two diamonds (♦♦) corresponds to a Category 2 impact rating. This means that the impact in question would be a *negative* impact with a Category 2 rating. After impacts have been rated, they can be placed in a rank order from highest to lowest category.

Assessing Toxicological Risks

Air and water emissions that are in compliance with permits are presumed to be protective of human health. It is not unusual, however, for community stakeholders to raise a variety of questions specifically about exposures to hazardous materials and the likelihood of associated adverse health impacts. The investigation and evaluation of community exposure to potentially hazardous materials has been the subject of numerous publications in the established scientific literature, and a standard conceptual framework has been developed and published in standard textbooks of occupational and environmental medicine and toxicology.

In order to determine that a substantial medical effect could be caused by a potential exposure, it is necessary to proceed in a logical fashion that establishes the presence of a complete (unbroken from source to exposure point) exposure pathway and appropriately assesses the likelihood of exposure. The best way to show this causal chain is through the use of a conceptual site model (CSM) that clearly diagrams the exposure pathway. Typically, the concentration of any chemical(s) under investigation at the logical exposure points (i.e., the geographical locations where an individual comes in contact with the source material) is determined. This fate and transport evaluation is generally done by the environmental assessment team and provided to the HIA practitioner who then calculates the potential dose received by the individual at the exposure points. Finally, the practitioner analyzes the health effects of the dose-response relationship of the chemical(s) under investigation so that an assessment of potential health risks can be made.

The HIA analysis of potential community health impacts from emissions related to a proposed project is best performed using this standard medical toxicological model:

Source → Exposure → Dose → Health Effect(s)

This form of the medical toxicological model is discussed in the 1991 National Research Council monograph, *Human Exposure Assessment for Airborne Pollutants: Advances and Opportunities*. Similar materials are available from the National Resource Council (NRC), Agency for Toxic Substances and Disease Registry (ATSDR), WHO and US Environmental Protection Agency (EPA), including the 2008 NRC publication *Science and Decision: Advancing Risk Assessment.* The key points emphasized in contemporary risk assessment

literature are the need to tie the risk-management questions to the risk assessment, and calculations should not be performed simply because computational capacity exists. The literature also discusses how to align the detail of uncertainty and variability analyses with what is actually needed to inform risk management decisions.

Section 9: Making Health Recommendations

General Considerations

Once health impacts have been identified, the HIA practitioner can make recommendations to maximize beneficial impacts and minimize potentially harmful impacts. Although recommendations are presented as the final phase of an HIA, they should be considered throughout the process, beginning as the project is being conceptualized and designed, and ending when impacts from the project and decommission have concluded.

In general, recommendations should be closely tied to the most important potential impacts. In the context of a NEPA analysis, the health assessment and recommendations should be carefully coordinated with the NEPA environmental and social assessments and the overall language of the EIS. In some circumstances, if the project is large or complex, a separate chapter on health recommendations may be appropriate. The federal agency may include health recommendations as mitigation measures in the EIS. As with other mitigation measures, the effectiveness of the recommendation and the potential that the recommendation would be implemented must be disclosed.

Even though well-developed generic health intervention strategies have been developed for many problems (e.g., infectious diseases), the HIA practitioner should develop recommendations that are scientifically defensible (evidence-based) and tailored to the local situation. The HIA practitioner should also consider recommendations rooted in local traditional knowledge, if applicable.

Some important considerations for health recommendations include determining the following:

- The feasibility of the potential health recommendations (e.g., engineering interventions that affect water quantity, quality, and sanitation)
- The appropriate timeline to implement the recommendations
- The availability of interim recommendations that would benefit communities
- The sustainability of, and responsibility for, implementing the recommendations. If the agencies do not have regulatory authority to implement the recommendations, then what?

It is important to be very clear about any prevention strategies or plans that are based on HIA recommendations. Significant community reactions can develop when the conditions for prevention efforts are not clarified and explained. It is, likewise, important to be very clear regarding the likelihood that the recommendations will be adopted by the agencies, project applicant, or communities.

How are recommendations used?

As discussed above, recommendations in an HIA that is developed to evaluate health for a NEPA process, would generally be included in the EIS. The recommendations would be grouped with the mitigation measures, and may be called mitigation measures depending upon the wording of the recommendation. EISs must identify “means to mitigate adverse impacts”, even if the mitigation measures cannot be required by the lead or cooperating agencies.

Recommendations may be used by applicants to revise project design and implement prevention strategies. The applicant may use the outcomes of the impact rating step (Section 8) to establish actions that will limit the severity of identified impacts. Applicants may also make voluntary contributions to maximize potential benefits in affected communities. Similarly, project proponents may use HIA recommendations to voluntarily negotiate a series of specific commitments to affected communities (e.g., participatory monitoring of certain impacts, subsistence resource access, quantity and quality).

Recommendations may also be used by decision makers to set certain conditions (i.e., permit stipulations) for project approval.

Even if HIA recommendations are not engaged by federal agencies or proponents, other stakeholders may use the recommendations to pursue their own human health objectives.

The publication of the HIA recommendations is likely to result in public and political pressure to adopt many of the recommendations, even though they are discretionary. It is therefore important that the HIA practitioner take care that all recommendations are appropriately designed for the site and the health concern at issue.

Fundamental Concepts

Health recommendations in an HIA are aimed at preventing disease and promoting health in communities. Some recommendations require action by the applicant. Other recommendations may suggest community action; successful implementation of these health recommendations usually requires stakeholder involvement.

Disease Prevention

Disease prevention includes any intervention that seeks to reduce or eliminate diagnosable disease. It may be applied at the individual level (e.g., immunization) or at the community level (e.g., an improved community sanitation system, or chlorination of the water supply).

The concept of disease prevention is often divided into three levels: primary, secondary, and tertiary:

- **Primary Prevention** – Prevents the condition *before it occurs* (e.g., preventing diabetes before it develops). For an HIA, these actions include elimination (eliminate certain features of the project), timing of the project (such as to avoid interfering with subsistence activities), substitution (for example, providing diesel fuel as a fuel source instead of wood), design or engineering preventions, and administrative controls.

- **Secondary Prevention** – Once a health condition exists, secondary prevention seeks to screen individuals at high risk for *early detection and prompt intervention* to control disease and minimize disability (e.g., early diagnosis of diabetes and accurate management to prevent vascular symptoms).

- **Tertiary Prevention** – Measures aimed at softening the impact of long-term disease and disability by eliminating or reducing impairment and maximizing potential years of quality life. This usually involves treatment or rehabilitation of existing, serious problems, such as preventing infection of diabetic foot ulcers. Tertiary prevention is

appropriate when the project has had some effect and this effect has caused health impacts. Tertiary prevention seeks to keep the human health impacts from continually affecting communities or from affecting a wider circle of people.

Health Promotion

In addition to disease prevention, the HIA may recommend activities that involve health promotion and education. This includes any combination of health education and related interventions designed to facilitate improved health through behavioral and environmental adaptations. In combination with primary prevention, health promotion and education is the most efficient and cost-effective method of managing potential impacts.

A workforce health promotion and education effort spearheaded by the project can also substantially influence behaviors and practices in local communities by using the project workforce as peer educators and ambassadors to local communities.

Important Characteristics for Recommendations

Evaluation of the recommendations requires identification of resource flows and responsibilities, local absorptive capacity, and social and environmental determinants.

Resource Flow and Responsibilities

The effectiveness of any plan to implement recommendations depends on adequate resources and careful delegation of responsibility between stakeholders. Among the most challenging tasks is assessing local resources for implementation and identifying reliable partners that can sustain any prevention plans. Local participation in prevention plans requires preparation, experience, and sufficient human and financial resources.

In one example from international HIA work, proponents will often build and/or refurbish hospitals, clinics, or health dispensaries in response to recommendations from an HIA. Although these activities are highly visible and initially well received, they are difficult to sustain long-term due to shortage of technical support staff such as physicians, nurses and laboratory technicians. To be sustainable, structural improvements should be coupled with a realistic and long-term assessment of the locally available human resources.

Experience also shows that prevention plans have a greater sustainability when they are focused on specific project effects, such as adequate drinking-water supply, solid and human waste disposal, and appropriate systems to deal with the influx of workers in a community.

Social Determinants of Health Issues

A variety of important potential positive and negative indirect effects tied to SDH and psychosocial issues (e.g., alcohol, drug use, gender violence, suicide) may be identified. Prevention plans that are directed towards social determinants must:

- Coordinate with mitigation strategies from the social impact assessment
- Be carefully reviewed, and the roles and responsibilities realistically appraised
- Account for the existence of personal choice
- Be clearly defined to include factors that are within the span of control of the project

(e.g., workforce scheduling, imposition of a “dry status” at all project facilities, pre-employment and random drug, and alcohol testing)

- Be developed in collaboration with the community, if possible

Strategies directed towards social determinants require a multidisciplinary effort, involving social and medical specialists, and community stakeholders.

Section 10: Monitoring and Evaluation

Once recommendations and prevention strategies are selected, the HIA practitioner can formulate a monitoring and evaluation (M&E) plan to help stakeholders determine if intervention strategies are achieving their intended effect. The M&E plan is often anchored to a set of key performance indicators (KPIs). In general, KPIs can measure the following:

- Change in a health outcome (e.g., increased clinic visits for prenatal care)
- Change in an intermediate health risk indicator (e.g., body mass index is a risk factor for problems such as cardiovascular disease and diabetes mellitus)
- Change in a health hazard or health determinant (e.g., fine particulates in air constitute a health hazard that influences asthma rates)

Monitoring and evaluation are presented here as a widely accepted step in the HIA process. *The funding and support for monitoring efforts is voluntary and not required under Alaska law.* Therefore, careful consideration should be given to making recommendations that would require follow-up that has no identified sources of funding.

Key Performance Indicators

Numerous KPIs have been established for monitoring health performance (Mosse and Sontheimer, 1996). In general, KPIs fall into the following three categories:

- **Structural indicators** – Buildings, equipment, drugs, medical supplies, vehicles, personnel, money, and organizational arrangements
- **Process indicators** – Effectiveness of the preventive actions
- **Outcome indicators** – Death, disease, disability, discomfort, and dissatisfaction are typically considered outcome measures (typically calculated as rates)

Some specific examples of the more common KPIs include the following:

Structural

- Household characteristics (household size, number of rooms)
- Pharmacy supplies of specific categories of drugs
- Sanitation systems such as septic tanks, latrines, etc.
- Water supply systems – indoor supply percent
- Solid waste – permitted landfill vs. open dump
- Tribal health facilities

Process

- Access to maternal medical services (such as trained birth attendants) and number of pre-delivery visits
- In-migration patterns (place of origin of household members, professional status of household members)
- Training with follow-up knowledge, attitudes, practices, beliefs concerning prevailing diseases

Outcome

- Disease-specific prevalence rates
- Anemia prevalence
- Anthropometric measurements
- Alcohol use, smoking rates, domestic violence, and accidents
- Toxicology-biomonitoring (lead, arsenic, etc.), if relevant
- Increase or decrease in prevalent disease
- Appearance of new disease

The baseline health assessment must be as complete as possible in order to observe changes in the KPIs. As discussed in Section 6, Alaska reports health information at the state or regional level, but not typically for individual communities. Given these limitations, the HIA practitioner should choose KPIs that can be tracked using readily available statewide or regional data. The selection of appropriate and relevant KPIs requires careful technical review by epidemiologists and biostatisticians.

There are several features common to a well-selected KPI. First, KPIs should be measurable. This presents a particular challenge in small rural Alaskan communities because the size of the population limits the statistical reliability of many disease rates. Even so, the HIA practitioner can select KPIs that report health risk factors or intermediate health indicators that serve as a proxy for the health issues of interest.

Second, KPIs should measure impacts to both the project workforce and the community. For instance, a KPI that measures a health impact in the project workforce may also give excellent information about the wider rural or urban environment surrounding the project. This is especially true when the project employs a large local workforce. Therefore, many of the monitoring strategies originate inside the fence line and extend outside to specific project-affected areas.

Third, KPIs should detect both acute and chronic changes within PACs. Acute changes appear within weeks to months, such as acute disease-rate changes for respiratory infection. Chronic non-communicable disease-rate changes for diabetes or cardiovascular disorders evolve over a much longer period of time. A well-selected set of KPIs will detect both acute and chronic changes in health status.

Fourth, the HIA practitioner should select KPIs that are clearly linked to the project. Monitoring and evaluating community health changes unrelated to a project is important, but beyond the scope of the HIA.

Fifth, the KPIs should capture both positive and negative health impacts. For example, the alleviation of income poverty will produce both positive and/or negative changes across many health outcomes.

Finally, KPIs should be drawn as much as possible from existing health information systems. For example, Alaska administers a state version of the Behavioral Risk Factor Surveillance System (BRFSS) each year, so KPIs drawn from BRFSS will be available for review on an annual basis.

KPIs based on traditional knowledge can be selected in collaboration with stakeholders. However, these KPIs should meet as many of the above criteria as possible, in order to have an appropriate indicator that is relevant, robust, and measurable.

Internationally, the development of district and local-level demographic surveillance systems (DSS) has been shown to be an effective method of long-term longitudinal surveillance.

Verification

The HIA practitioner may also recommend a verification system so that the progress of the disease prevention and health promotion efforts can be reviewed at a community level. For most projects, it is unrealistic to begin the verification process before the project has collected at least 6–12 months of information. For most health indicators, yearly verification reviews are likely to be sufficient. Formal external verification for health performance should be performed at selected time intervals, but it is possible to create a platform for more frequent community stakeholder involvement and input. Verification systems should be integrated with, and not duplicative of, other environmental verification systems, such as periodic environmental audits already required by the State for mining projects. Verification systems should also be transparent and include a mechanism for community input into the process.

Section 11: Resourcing

ADHSS serves as the State of Alaska's technical lead on HIA, but other entities conduct HIA work in the State. If project proponents wish to work through the State of Alaska HIA program, they can make funding arrangements through the large mine permitting team (LMPT) within, ADNR/OPMP, or another state agency involved with coordinating development projects. In general, funding is not provided by the State of Alaska for preparation of HIAs.

If other entities wish to perform HIA, there are a number of grant-based opportunities available through the U.S. Centers for Disease Control and Prevention, the Robert Wood Johnson Foundation, and the Pew Charitable Trust. Links to these and other resources are listed on the State of Alaska HIA Program website (available at: http://epi.alaska.gov/hia).

The financial and human resources allocated to an HIA ought to be commensurate with the potential anticipated risks. Costs are largely a function of the scope of the type of HIA to be performed (i.e., desktop, rapid appraisal, and comprehensive), and the need for new data collection. New data collection is often a difficult, time-consuming, and expensive process. Coordination with the environmental and social impact assessment process will minimize duplication and delays in schedules.

Disclaimer: The information contained in the following resource materials does not necessarily represent the viewpoint of the State of Alaska, the HIA program, or the HIA Working Group.

HIA Information Websites:

Alaska Department of Health and Social Services, HIA:
http://www.epi.alaska.gov/hia
North Slope Borough, HIA
http://www.north-slope.org/departments/health-social-services/baseline-community-health - analysis-report
UCLA HIA Clearinghouse Learning and Information Center:
http://www.ph.ucla.edu/hs/hiaclic/index.htm
U.K Association of Public Health Observatories HIA Gateway:
http://www.apho.org.uk/default.aspx?RID=44538
HIA Community Wiki:
http://www.seedwiki.com/wiki/health_impact_assessment_hia_community_wiki/
World Health Organization HIA :
http://www.who.int/hia/en/
Centers for Disease Control and Prevention:
http://www.cdc.gov/healthyplaces/hia.htm

Comprehensive database of HIAs completed or in progress in the US, sortable by topic and keyword:

www.healthimpactproject.org/hia/us

International Natural Resource Development HIAs:

Margam Open Cast Mine Extension HIA (Wales):

http://www.wales.nhs.uk/sites3/Documents/522/Kenfig%20Hill%20Final%20%2D%20Dec%2005.pdf

Report of a Canada mining HIA: Kwiatkowski R, Ooi M. 2003. Integrated Environmental Impact Assessment: A Canadian Example. Bulletin of the World Health Organization. 81: 434-438 Available online at http://www.who.int/bulletin/volumes/81/6/kwiatkowski.pdf

Voluntary HIA's outside the Resource Development Sector:

Oak to Ninth Housing Development HIA:
http://ehs.sph.berkeley.edu/hia/O2N.HIA.FullDraft.pdf

Humboldt County General Plan. HIA and related documents at:
http://www.humanimpact.org/component/jdownloads/finish/4/58

The Atlanta Beltline Redevelopment HIA, at:
http://www.hiaguide.org/hia/atlanta-beltline-health-impact-assessment

U.S. Natural Resource Development Sector:

U.S. Department of the Interior, Minerals Management Service (2008). *Draft EIS, Beaufort and Chukchi Sea Multiple Lease Sales.* Health subsections integrated into chapters on Environmental Justice, and Appendix J. Minerals Management Service: Anchorage, Alaska.

U.S. EPA (2008) Draft Red Dog Mine/Aqqaluk Extension Supplemental EIS. Subsections on Public Health. Anchorage, Alaska. Seattle, WA.

Bureau of Land Management: *Northeast NPR-A Draft Supplemental Environmental Impact Statement.* Subsections on Public Health. Anchorage, AK: Bureau of Land Management. The Final SEIS can be downloaded at:
http://www.blm.gov/ak/st/en/prog/planning/npra_general/ne_npra/northeast_npr-a_final.html

Guidance and Toolkits:

Guidance for Stakeholder Participation in HIA:
http://www.healthimpactproject.org/resources/document/Guide-for-Stakeholder-Participation.pdf

Health Effects Assessment Tool:
http://www.erm.com/Global/Publications/ERM_HealthEffectsofResourceDevelopmentProjects.pdf

HIA Minimum Elements and Practice Standards:
http://www.humanimpact.org/doc-lib/finish/11/9

IFC Introduction to Health Impact Assessment:
http://www.ifc.org/ifcext/sustainability.nsf/Content/Publications_Handbook_HealthImpactAssessment

IFC Guidance Note 4 – Community Health and Safety:
http://www.ifc.org/ifcext/sustainability.nsf/AttachmentsByTitle/pol_GuidanceNote2007_4/$FILE/2007+Updated+Guidance+Note_4.pdf

IMCC Good Practice Guidance on Health Impact Assessment, International Council of Mining and Metals.

Improving Health in the United States: The Role of Health Impact Assessment, Committee on Health Impact Assessment, Board on Environmental Studies and Toxicology, National Research Council (NRC), National Academy of Science, 2011.

National Research Council of the National Academies, "Improving Health in the United States: the Role of HIA." A comprehensive guide to HIA and integrated health into the NEPA process:
http://www.iom.edu/~/media/Files/Activity Files/Environment/EnvironmentalHealthRT/2011-Nov-RT/132291.pdf

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Listorti, 1996. Bridging Environmental Health Gaps. Vols. I-III. AFTES Working Paper No. 22. World Bank, Environmentally Sustainable Development Division, Africa Technical Department. Washington, D.C.

North American HIA Practice Standards Working Group. Minimum Elements and Practice Standards for Health Impact Assessment – November 2010, Version 2: http://www.humanimpact.org/doc-lib/finish/11/9

Mosse & Sontheime, 1996. World Bank document available at: http://wwwwds.worldbank.org/external/default/WDSContentServer/WDSP/IB/1996/09/01/000009265_3961219094954/Rendered/PDF/multi_page.pdf

National Research Council of the National Academies, "Improving Health in the United States: the Role of HIA." A comprehensive guide to HIA and integrated health into the NEPA process: http://www.iom.edu/~/media/Files/Activity Files/Environment/EnvironmentalHealthRT/2011-Nov-RT/132291.pdf

Winkler et al. 2010. Assessing health impacts in complex eco-epidemiological settings in the humid tropics: Advancing tools and methods.

WHO, 1999. Health 21, World Health Organization. Regional Office for Europe, Available online at: http://www.euro.who.int/data/assets/pdf_file/0004/109759/EHFA5-E.pdf

WHO, 2008. Social Determinants of Health, World Health Organization. Available online at: http://www.who.int/social_determinants/thecommission/finalreport/en/index.html

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